39th Annual Meeting
The American Society of Pediatric Neurosurgeons

January 31–February 5, 2016
THE RITZ-CARLTON, ARUBA
The American Society of Pediatric Neurosurgeons

History and Purpose
The American Society of Pediatric Neurosurgeons was founded initially as the American Society for Pediatric Neurosurgery in St. Maarten, Netherlands Antilles on January 17, 1978 by eighteen North American Neurosurgeons, each of whom expressed a particular interest in children’s neurological surgery.

The purpose of the Society shall be to improve the neurosurgical care of the children of the United States and Canada by advancing and advocating the specialty of Pediatric Neurosurgery.

Mission Statement
The ASPN is committed to discovering, defining, and delivering the best care for patients with pediatric neurosurgical disease regardless of their age. We are further committed to dissemination of this information to all providers who care for these patients and to being the primary source of this information for physicians in training.

The ASPN shall accomplish this goal by:

• Identifying individuals who meet its criteria for being Pediatric Neurosurgeons and show a continuing dedication to Pediatric Neurosurgery,

• Providing leadership in the identification and dissemination of the knowledge and the science of Pediatric Neurosurgery, including but not limited to conducting regular scientific meetings,

• providing leadership in the education of all medical professionals, to include monitoring and ascertaining the appropriate neurosurgical care of patients with pediatric neurosurgical diseases (the Society recognizes that in some cases these disease processes start in childhood and extend throughout life),

• providing guidance for the non-medical public, including pediatric neurosurgery patients and their families,

• being an advocate for the child, on issues of importance to the neurological health of the child.
ASPN Officers and Committees

Executive
Alan R. Cohen, M.D. President
Richard G. Ellenbogen, M.D. President-Elect
James M. Drake, M.D. Secretary
John Ragheb, M.D. Treasurer
Jeffrey G. Ojemann, M.D. Member at Large

AD HOC QUALITY and SAFETY
Bradley E. Weprin, M.D. Chair

Annual Meeting
Gerald A. Grant, M.D. Scientific Program Chair

Bylaws
Howard L. Weiner, M.D. Chair

Credentials
Matthew D. Smyth, M.D. Chair

Education
Gerald A. Grant, M.D. Chair

NOMINATING
Rick Abbott, M.D.

Past Presidents of the Society

Founding Members of The American Society of Pediatric Neurosurgeons

A. Loren Amacher, M.D., HARTFORD, CONNECTICUT
Derek A. Bruce, M.B., Ch.B., PHILADELPHIA, PENNSYLVANIA
Fred J. Epstein, M.D., NEW YORK, NEW YORK
Howard M. Eisenberg, M.D., GALVESTON, TEXAS
Francisco Gutierrez, M.D., CHICAGO, ILLINOIS
E. Bruce Hendrick, M.D., TORONTO, ONTARIO, CANADA
Harold J. Hoffman, M.D., TORONTO, ONTARIO, CANADA
Robin P. Humphreys, M.D., TORONTO, ONTARIO, CANADA
Hector E. James, M.D., SAN DIEGO, CALIFORNIA
David Klein, M.D., BUFFALO, NEW YORK
David G. McLone, M.D., Ph.D., CHICAGO, ILLINOIS
Mark O’Brien, M.D., ATLANTA, GEORGIA
Anthony J. Raimondi, M.D., CHICAGO, ILLINOIS
Donald H. Reigel, M.D., PITTSBURGH, PENNSYLVANIA
Luis Schut, M.D., PHILADELPHIA, PENNSYLVANIA
Martin P. Sayers, M.D., COLUMBUS, OHIO
Timothy B. Scarff, M.D., PITTSBURGH, PENNSYLVANIA
Joan L. Venes, M.D., ANN ARBOR, MICHIGAN

Deceased Members

Joan L. Venes, M.D. (1935–2010)

Past Harold and JoAnn Hoffman Lecturers

2007 David G. McLone, M.D., Ph.D.  2012 Jeff Miller
2008 Marion L. Walker, M.D., Ph.D.  2013 John R. Potts, M.D.
2009 John Douglas Lymer  2014 Debra DaRosa, Ph.D.
2010 Justice Stephen Goudge  2015 John Ioannidis, M.D.
2011 Melanie Walker, M.D.

Past Robert Pudenz Lecturers

2000 Mark Del Bigio, M.D.  2003 Peter C. Burger, M.D.
2001 James Bean, M.D.  2004 James Dearth, M.D.
2002 Concezio DiRocco, M.D.  2005 Eric C. Holland, M.D., Ph.D.
Past Meetings of the Society

1978  Oyster Pond Yacht Club, St. Maarten, Netherlands Antilles, JAN. 15–21
1979  Peter Island Yacht Club, Peter Island, BVI, JAN. 7–13
1980  Peter Island Yacht Club, Peter Island, BVI, JAN. 6–12
1981  Costa De Careyes, Jalisco, Manzanillo, Mexico, FEB. 8–14
1982  Casa de Campo, Santo Domingo, Dominican Republic, FEB. 21–27
1983  St. James Beach Club, St. James, Barbados, WI, FEB. 20–26
1984  Mauna Kea Hotel, Kona, Hawaii, JAN. 22–28
1985  Palmas Del Mar, Humacao, Puerto Rico, FEB. 10–16
1986  Tryall Golf and Beach Club, Montego Bay, Jamaica, MARCH 2–8
1987  Mauna Kea Hotel, Kona, Hawaii, JAN. 25–31
1988  Peter Island Yacht Club, Peter Island, BVI, FEB. 7–13
1989  Carambola Beach Resort and Golf Club, St. Croix, USVI, JAN. 8–15
1990  Kapalua Beach Hotel, Maui, Hawaii, FEB. 11–17
1991  Condado Beach Hotel, San Juan, PR, FEB. 10–16
1992  Mauna Kea Beach Hotel, Kona, Hawaii, JAN. 26–FEB. 1
1993  Frenchman’s Reef Resort, St. Thomas, USVI, JAN. 26–FEB. 1
1994  Four Seasons Resort, Nevis, West Indies, FEB. 6–12
1995  Manele Bay Hotel, Lana’i, Hawaii, JAN. 22–28
1996  Mauna Lani Bay Hotel, Kona, Hawaii, JAN. 28–FEB. 3
1997  Westin Carambola Beach Resort, St. Croix, USVI, JAN. 26–FEB. 1
1998  Manele Bay Hotel, Lana’i, Hawaii, JAN. 25–30
1999  Four Seasons Resort, Nevis, West Indies, JAN. 24–30
2000  Four Seasons Resort at Hualalai, Kona, Hawaii, JAN. 31–FEB. 5
2001  Kapalua Bay Hotel, Maui, Hawaii, JAN. 28–FEB. 2
2002  Four Seasons Resort, Nevis, West Indies, JAN. 27–FEB. 1
2003  Four Seasons Resort at Hualalai, Kona, Hawaii, FEB. 2–7
2004  Paradisus Playa Conchal, Guanacaste, Costa Rica, FEB. 2–7
2005  Four Seasons Resort, Maui, Hawaii, JAN. 30–FEB. 4
2006  Four Seasons, Great Exuma, Bahamas, JAN. 29–FEB. 3
2007  Four Seasons, Lana’i, Hawaii, JAN. 28–FEB. 2
2008  Hilton Resort, Los Cabos, Mexico, FEB. 3–8
2009  Fairmont Orchid, Kohala Coast, Hawaii, JAN. 25–30
2010  Ritz-Carlton, Grand Cayman, JAN. 24–29
2011  Four Seasons, Lana’i, Hawaii, JAN. 30–FEB. 4
2012  St. Regis Resort, Bahia Beach Puerto Rico, JAN. 29–FEB. 3
2013  St. Regis Princeville, Kauai, Hawaii, FEB. 10–15
2014  Four Seasons Costa Rica, JAN. 26–31
2015  Fairmont Orchid, Kohala Coast, Hawaii, JAN. 25–30
2016  Ritz Carlton, Aruba, JAN. 31–FEB. 5

Future Meeting Sites

2017  Fairmont Kea Lani, Maui, Hawaii, JAN. 22–27
The 2016 Harold and JoAnn Hoffman Lecturer

James L. Reinertsen, M.D.

Dr. James Reinertsen heads The Reinertsen Group, an independent consulting and teaching practice focused on improving the clinical quality performance of health care organizations. From 2001 to 2013, he was a Senior Fellow at the Institute for Health Care Improvement in Boston, where he developed and delivered IHI’s programs for Boards, executives, and physician leaders. The winner of the 2011 John L. Eisenberg Individual Achievement Award for his decades of US and International leadership for clinical quality and safety, Dr. Reinertsen has an unusual combination of skills and experience. He practiced internal medicine and rheumatology for 20 years, and has also been an influential and admired health system CEO, leading health care quality improvement in medical groups, hospitals, and academic health centers. He was the CEO of Park Nicollet Health Services in Minneapolis from 1986–1998, and the CEO of a 6 hospital system in Boston, (CareGroup, including the Beth Israel Deaconess Medical Center, Mount Auburn, and New England Baptist hospitals) from 1998–2001. Dr. Reinertsen was a founder and first Chairman of the Minnesota’s Institute for Clinical Systems Improvement, and is a former board member of the American Board of Internal Medicine, as well as the former Chairman of the Board of the American Medical Group Association. He is an Honorary Fellow of the English National Health Service’s Institute for Innovation and Improvement. The author of over 70 scholarly papers, and a 2005 book titled *Ten Powerful Ideas for Patient Care Improvement*, Dr Reinertsen is a graduate of St. Olaf College and Harvard Medical School.
International Guest Lecturer

Henry W.S. Schroeder, M.D., Ph.D.

Our Honored International Guest is Henry Schroeder, M.D., Ph.D. Henry is Professor and Chairman of the Department of Neurosurgery at the University Medical Center in Greifswald, Germany.

He serves as Chairman of the Neuroendoscopy Committee of the World Federation of Neurosurgical Societies.

Dr. Schroeder is one of the leading neuroendoscopists and microneurosurgeons in the world.
Invited Attending Guests

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Invited Attending Guests (continued)

Manish Shah, M.D.  
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Program Objectives

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

1. Recognize factors that lead to complications and poor outcomes when treating children with pediatric neurosurgical disorders.
2. Discuss new and different strategies for how to best manage difficult cases in pediatric neurosurgery.
3. Discuss current research and developments in diagnostics techniques, methods of therapy, and treatment alternatives for the management of children with pediatric neurological disorders.

Method of Instruction

This will be a live presentation, with interactive discussion, case studies, lectures, panel discussions, and abstract presentations.

Who Attends

This annual meeting is open to ASPN members and guest physician of members. Please note that members may recommend guest physicians to attend the meeting, but the final selection of all guest physicians is decided by the ASPN Executive Committee.

Planners

The following person planned or contributed to the planning of this CME activity:

Gerald A. Grant, M.D., ASPN SCIENTIFIC PROGRAM CHAIR
Alan R. Cohen, M.D., ASPN PRESIDENT
James M. Drake, M.D., ASPN SECRETARY
Laura K. West, ASPN MEETING PLANNER
Joint Providership Accreditation Statement

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 American Society of Pediatric Neurosurgeons. The AANS is accredited by the ACCME to provide continuing medical education for physicians.

Designation Statement

The AANS designates this live activity for a maximum of 20.5 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Joint Providership Disclaimer

The material presented at the 39th Annual Meeting of the American Society of Pediatric Neurosurgeons (ASPN) has been made available by the ASPN and the AANS for educational purposes only. The material is not intended to represent the only, nor necessarily the best, method or procedure appropriate for the medical situations discussed, but rather it is intended to present an approach, view, statement, or opinion of the faculty, which may be helpful to others who face similar situations.

Neither the content (whether written or oral) of any course, seminar or other presentation in the program, nor the use of a specific product in conjunction therewith, nor the exhibition of any materials by any parties coincident with the program, should be construed as indicating endorsement or approval of the views presented, the products used, or the materials exhibited by the ASPN and jointly provided by the AANS, or its Committees, Commissions, or Affiliates.

Neither the AANS nor the ASPN makes any statements, representations or warranties (whether written or oral) regarding the Food and Drug Administration (FDA) status of any product used or referred to in conjunction with any course, seminar or other presentation being made available as part of the 39th Annual Meeting of the American Society of Pediatric Neurosurgeons. Faculty members shall have sole responsibility to inform attendees of the FDA status of each product that is used in conjunction with any course, seminar or presentation and whether such use of the product is in compliance with FDA regulations.
Disclosures
The AANS and ASPN control the content and production of this CME activity and attempt to ensure the presentation of balanced, objective information. In accordance with the Standards for Commercial Support established by the Accreditation Council for Continuing Medical Education (ACCME), faculty, abstract reviewers, paper presenters/authors, planning committee members, staff, and any others involved in planning the educational content and the significant others of those mentioned must disclose any relationship they or their co-authors have with commercial interests which may be related to their content. The ACCME defines “relevant financial relationships” as financial relationships in any amount occurring within the past 12 months that create a conflict of interest.

Faculty Disclosures

<table>
<thead>
<tr>
<th>Faculty Name</th>
<th>Disclosure</th>
<th>Type Of Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark Dias, M.D.</td>
<td>Pennsylvania Dept of Health Allergan Pharm.</td>
<td>Univ. Grants/Research Support</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other/Material Support</td>
</tr>
<tr>
<td>Gerald Grant, M.D.</td>
<td>NIH</td>
<td>Univ. Grants/Research Support</td>
</tr>
<tr>
<td>David Limbrick, M.D.</td>
<td>Karl Storz K. Storz, Aesculap, Medtronic</td>
<td>Univ. Grants/Research Support Industry Grant Support</td>
</tr>
<tr>
<td>Joseph Madsen, M.D.</td>
<td>NIH (incl SBIR subcontract to NeuroDx) Alcyone Life Sciences Alcyone Life Sciences</td>
<td>Univ. Grants/Research Support Industry Grant Support</td>
</tr>
<tr>
<td>Kim Manwaring, M.D.</td>
<td>Univ. of South Florida</td>
<td>Univ. Grants/Research Support</td>
</tr>
<tr>
<td>Carrie Muh, M.D.</td>
<td>Duke Univ. Cyberonics</td>
<td>Univ. Grant/Research Support Consultant Fee</td>
</tr>
<tr>
<td>Violette Recinos, M.D.</td>
<td>Acera Surgical (spouse)</td>
<td>Consultant Fee</td>
</tr>
<tr>
<td>David Sandberg, M.D.</td>
<td>Texas 4000 for CanCPT</td>
<td>Univ. Grant/Research Support</td>
</tr>
<tr>
<td>Jay Riva-Cambrin, M.D.</td>
<td>Primary Children Found., Hydrocephalus Assoc, PCoel, CDC</td>
<td>Univ. Grants/Research Support</td>
</tr>
<tr>
<td>Henry Schroeder, M.D.</td>
<td>Karl Storz GmbH &amp; Co. KG Tuttingen</td>
<td>Consultant Fee</td>
</tr>
<tr>
<td>Mathew Smyth, M.D.</td>
<td>Therma Neurosciences</td>
<td>Stock/Shareholder</td>
</tr>
<tr>
<td>Scellig Stone, M.D.</td>
<td>Alcyone Life Sciences</td>
<td>Consultant Fee</td>
</tr>
<tr>
<td>Jeffrey Wisoff, M.D.</td>
<td>Zaflgen Pharm.</td>
<td>Consultant Fee</td>
</tr>
</tbody>
</table>
Speakers, their paper presenters/authors, and staff (and the significant others of those mentioned) who have reported they do not have any relationships with commercial companies:

Laurie Ackerman, M.D.  Jeffrey Greenfield, M.D.
Gregory Albert, M.D.  Naina Gross, M.D.
Philipp Aldana, M.D.  David Gruber, M.D.
Richard C.E. Anderson, M.D.  Dean Hertzler, M.D.
Luigi Bassani, M.D.  John Honeycutt, M.D.
David Bauer, M.D.  Usiakimi Igbaseimokumo, M.D.
Sanjiv Bhatia, M.D.  Eric Jackson, M.D.
Frederick Boop, M.D.  George Jallo, M.D.
Robin Bowman, M.D.  David Jimenez, M.D.
Ruth Bristol, M.D.  Bruce Kaufman, M.D.
Douglas L. Brockmeyer, M.D.  Paul Klimo, Jr., M.D.
Michael Burke, M.D.  Mark Krieger, M.D.
Alan R. Cohen, M.D.  Abhaya Kulkarni, M.D.
John Duncan, III, M.D., Ph.D.  Sandi Lam, M.D.
Susan Durham, M.D.  Suresh Magge, M.D.
Stephanie Einhaus, M.D.  Francesco Mangano, DO
Scott Elton, M.D.  Catherine Mazzola, M.D.
John-Pierre Farmer, M.D.  Hal Meltzer, M.D.
Andrew Foy, M.D.  Katy Meyer (AANS)
Saadi Ghatan, M.D.  John Myseros, M.D.
Paul Grabb, M.D.  Mahmoud Nagib, M.D.
Stephanie Greene, M.D.  Robert Naftel, M.D.
Christina Notarianni, M.D.  
Brent O’Neill, M.D.  
Katie Orrico, M.D.  
Michael Partington, M.D.  
Angela Price, M.D.  
Nathan Ranalli, M.D.  
James Reinertsen, M.D.  
Shenandoah Robinson, M.D.  
R. Michael Scott, M.D.  
Manish Shah, M.D.  
Edward Smith, M.D.  
Jodi Smith, M.D.  
Sandeep Sood, M.D.  
Charles Stevenson, M.D.  
Krystal Tomei, M.D.  
Eric Trumble, M.D.  
Gerald Tuite, M.D.  
Bradley Weprin, M.D.  
Laura West (Planner)  
David Wrubel, M.D.  
Marike Zwienenberg, M.D.
## Calendar of Events—Scientific Program

| MONDAY  
February 1 | TUESDAY  
February 2 | WEDNESDAY  
February 3 | THURSDAY  
February 4 | FRIDAY  
February 5 |
|-------------|-------------|-------------|-------------|-------------|
| **6:45 AM–7:20 AM**  
Breakfast for Registered Physicians  
Salon C | **6:45 AM–7:30 AM**  
Breakfast for Registered Physicians  
Ballroom Terrace and Courtyard | **6:45 AM–7:30 AM**  
Breakfast for Registered Physicians  
Ballroom Terrace and Courtyard | **6:45 AM–7:30 AM**  
Breakfast for Registered Physicians  
Ballroom Terrace and Courtyard | **6:45 AM–7:30 AM**  
Breakfast for Registered Physicians  
Ballroom Terrace and Courtyard |
| **7:20 AM–7:30 AM**  
Opening Remarks  
Ritz-Carlton Ballroom | **7:30 AM–9:00 AM**  
General Session IV: Spine  
Ritz-Carlton Ballroom | **7:30 AM–9:00 AM**  
General Session VI: Endoscopy  
Ritz-Carlton Ballroom | **7:30 AM–8:30 AM**  
General Session VIII: Hydrocephalus II  
Ritz-Carlton Ballroom | **7:30 AM–9:30 AM**  
General Session XI: Epilepsy  
Ritz-Carlton Ballroom |
| **7:30 AM–9:00 AM**  
General Session I: Tumors I  
Ritz-Carlton Ballroom | **9:00 AM–9:15 AM**  
Beverage Break  
Ritz-Carlton Ballroom Foyer | **9:00 AM–9:30 AM**  
International Masters Series Part II  
Henry W.S. Schroeder, M.D., Ph.D.  
Ritz-Carlton Ballroom | **8:30 AM–8:45 AM**  
Beverage Break  
Ritz-Carlton Ballroom Foyer | **9:30 AM–8:45 AM**  
Beverage Break  
Ritz-Carlton Ballroom Foyer |
| **9:00 AM–9:15 AM**  
Beverage Break  
Ritz-Carlton Ballroom Foyer | **9:15 AM–10:45 AM**  
General Session V: Hydrocephalus I  
Ritz-Carlton Ballroom | **9:30 AM–9:45 AM**  
Beverage Break  
Ritz-Carlton Ballroom Foyer | **8:45 AM–10:00 AM**  
General Session IX: Tumor II  
Ritz-Carlton Ballroom | **9:45 AM–11:00 AM**  
General Session XII: Congenital/Other  
Ritz-Carlton Ballroom |
| **9:15 AM–10:30 AM**  
General Session II: Tumors I Cont’d  
Ritz-Carlton Ballroom | **10:45 AM–11:00 AM**  
Beverage Break  
Ritz-Carlton Ballroom Foyer | **9:45 AM–11:00 AM**  
General Session VII: Chiari  
Ritz-Carlton Ballroom | **10:00 AM–10:15 AM**  
Beverage Break  
Ritz-Carlton Ballroom Foyer | **11:00 AM–11:15 AM**  
Beverage Break  
Ritz-Carlton Ballroom Foyer |
| **10:30 AM–11:00 AM**  
General Session III: Quality  
Ritz-Carlton Ballroom | **11:00 AM–11:15 AM**  
International Masters Series Part I  
Henry W.S. Schroeder, M.D., Ph.D.  
Ritz-Carlton Ballroom | **11:00 AM–11:15 AM**  
Beverage Break  
Ritz-Carlton Ballroom Foyer | **10:15 AM–11:15 AM**  
General Session X: Craniofacial  
Ritz-Carlton Ballroom | **11:15 AM–11:45 AM**  
Complications XIII: Congenital/Other cont’d  
Ritz-Carlton Ballroom |
| **11:00 AM–11:15 AM**  
Beverage Break  
Ritz-Carlton Ballroom Foyer | **11:15 AM–12:15 PM**  
Presidential Address  
Alan R. Cohen, M.D.  
Ritz-Carlton Ballroom | **11:15 AM–11:45 AM**  
Workforce Discussion  
Frederick A. Boop, M.D.  
Ritz-Carlton Ballroom | **11:15 AM–11:45 AM**  
Washington Update  
Katie Orrico, J.D.  
Ritz-Carlton Ballroom | **11:45 AM**  
Meeting Adjourns |
| **11:15 AM–12:15 PM**  
Harold and JoAnn Hoffman Lectureship  
James L. Reinertsen, M.D.  
Ritz-Carlton Ballroom | **11:45 AM–12:15 PM**  
Annual Business Meeting (open only to ASPN Members)  
Ritz-Carlton Ballroom | **11:45 AM–12:15 PM**  
Board Certification Discussion  
Ritz-Carlton Ballroom | **11:45 AM–12:15 PM**  
Board Certification Discussion  
Ritz-Carlton Ballroom | **11:45 AM–12:15 PM**  
Board Certification Discussion  
Ritz-Carlton Ballroom |
| **11:00 AM–12:15 PM**  
Harold and JoAnn Hoffman Lectureship  
James L. Reinertsen, M.D.  
Ritz-Carlton Ballroom | **11:15 AM–12:15 PM**  
Presidential Address  
Alan R. Cohen, M.D.  
Ritz-Carlton Ballroom | **11:15 AM–12:15 PM**  
Workforce Discussion  
Frederick A. Boop, M.D.  
Ritz-Carlton Ballroom | **11:15 AM–12:15 PM**  
Washington Update  
Katie Orrico, J.D.  
Ritz-Carlton Ballroom | **11:45 AM**  
Meeting Adjourns |
| **11:45 AM**  
Meeting Adjourns | **11:45 AM**  
Meeting Adjourns | **11:45 AM**  
Meeting Adjourns | **11:45 AM**  
Meeting Adjourns | **11:45 AM**  
Meeting Adjourns |
## Calendar of Events—Social Program

<table>
<thead>
<tr>
<th>SUNDAY</th>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
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<tbody>
<tr>
<td><strong>January 31</strong></td>
<td><strong>February 1</strong></td>
<td><strong>February 2</strong></td>
<td><strong>February 3</strong></td>
<td><strong>February 4</strong></td>
<td><strong>February 5</strong></td>
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<td>8:00 AM–9:00 AM Spouse Hospitality</td>
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<td>Madero Restaurant</td>
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<td></td>
<td>8:30 AM–9:30 AM Breakfast for Spouses, Guests and Children</td>
<td>9:30 AM–11:30 AM Book Club Van Gogh</td>
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<td>Madero Restaurant</td>
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<tr>
<td>6:00 PM–8:00 PM Welcome Reception</td>
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<td></td>
<td>6:30 PM–11:00 PM Gala Banquet and Cocktail Reception</td>
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<tr>
<td>Event Lawn Ritz Carlton</td>
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<td>Ritz-Carlton Ballroom</td>
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</table>
Scientific Program

MONDAY, February 1

6:45 AM–7:20 AM  Breakfast for Registered Physicians

7:20 AM–7:30 AM  Opening Remarks and Introduction of Fellows

7:30 AM–9:00 AM  GENERAL SESSION I: TUMOR I

Moderator: Jeffrey H. Wisoff, M.D., New York, NY

7:30 AM–7:45 AM  Ventricular Access Device Placement in the Fourth Ventricle to Treat Malignant Fourth Ventricle Brain Tumors
David I. Sandberg, M.D., Houston, TX

7:45 AM–8:00 AM  Posterior Transcallosal Approach for Pineal and Posterior 3rd Ventricle Pathology
Paul Klimo, Jr., M.D., MPH, Memphis, TN

8:00 AM–8:15 AM  Supracerebellar Transtentorial Approach to the Posterior Medial Temporal Lobe
Sanjiv Bhatia, M.D., Miami, FL

8:15 AM–8:30 AM  Lateral Oblique Position for Combined Occipital Transtentorial and Infratentorial Supracerebellar Approaches to Large Pineal Region Tumors
Andrew B. Foy, M.D., Milwaukee, WI

8:30 AM–8:45 AM  Treatment of Cabergoline Resistant Pituitary Macroadenoma
David Wrubel, M.D., Atlanta, GA

8:45 AM–9:00 AM  Is Neurofibromatosis Type I a Neurosurgical Disease?
Eric R. Trumble, M.D., Orlando, FL

9:00 AM–9:15 AM  Beverage Break

9:15 AM–10:30 AM  GENERAL SESSION II: TUMOR I cont’d

Moderator: George Jallo, M.D., St. Petersburg, FL

9:15 AM–9:30 AM  Feasibility and Clinical Application of Magnetic Resonance Fingerprinting
Krystal Tomei, M.D., MPH, Cleveland, OH

9:30 AM–9:45 AM  Increased Radiosensitivity with Histone Methyltransferase Inhibitors in Pediatric High Grade Glioma
Violette Recinos, M.D., Cleveland, OH

9:45 AM–10:00 AM  An AVM in an Addict with Auditory Abnormalities
Saadi Ghatan, M.D., New York, NY

10:00 AM–10:15 AM  Real-time Ultrasound-guided Catheter Guided Navigation for Approaching Deep-seated Brain Lesions
Edward R. Smith, M.D., Boston, MA

10:15 AM–10:30 AM  Challenging Case: A 10-year-old Boy with a Brain Stem Tumor
Catherine A. Mazzola, M.D., Morristown, NJ

10:30 AM–11:00 PM  GENERAL SESSION III: QUALITY

Moderator: Douglas L. Brockmeyer, M.D., Salt Lake City, UT

10:30 AM–10:45 AM  A Systems Engineering Approach to Reducing Intrathecal Baclofen Pump Surgical Complications
Shenandoah Robinson, M.D., Boston, MA

10:45 AM–11:00 AM  Quality Improvement and Increased Value from Implementation of a Multidisciplinary Care Pathway for Craniosynostosis Surgery
Sandi Lam, M.D., MBA, Houston, TX
### MONDAY, February 1 (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>11:00 AM-11:15 AM</td>
<td>Beverage Break</td>
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<tr>
<td>11:15 AM</td>
<td>Introduction of Harold and JoAnn Hoffman Lecturer</td>
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<td><em>Thomas G. Luerssen, M.D., Houston, TX</em></td>
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<tr>
<td>11:15 AM-11:45 AM</td>
<td>Harold and JoAnn Hoffman Lectureship</td>
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<td><em>James L. Reinertsen, M.D.</em></td>
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<td><em>Reinertsen Group, Alta, WY</em></td>
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<td>11:45 AM-12:15 PM</td>
<td>Lecture Discussion</td>
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<td><em>Moderator: Bradley E. Weprin, M.D., Dallas, TX</em></td>
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### TUESDAY, February 2

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>6:45 AM-7:30 AM</td>
<td>Breakfast for Registered Physicians</td>
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<td>7:30 AM-9:00 AM</td>
<td><strong>GENERAL SESSION IV: SPINE</strong></td>
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<td><em>Moderator: Richard C.E. Anderson, M.D., New York, NY</em></td>
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<tr>
<td>7:30 AM-7:45 AM</td>
<td>C1-2 Instability from Os Odontoideum Mimicking Intramedullary Spinal Cord Tumor: Report of Two Cases</td>
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<td><em>Richard C.E. Anderson, M.D., New York, NY</em></td>
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<td>7:45 AM-8:00 AM</td>
<td>Neurofibromatosis Type 1: The Case of the Disappearing Spine</td>
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<td><em>Francesco Mangano, D.O., Cincinnati, OH</em></td>
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<td>8:00 AM-8:15 AM</td>
<td>Postoperative Quadriplegia Following Spinal Cord Decompression: Implications for Intraoperative Monitoring</td>
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<td><em>Douglas L. Brockmeyer, M.D., Salt Lake City, UT</em></td>
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<tr>
<td>8:15 AM-8:30 AM</td>
<td>More Complicated than A-B-C: A Formidable Cervical Aneurysmal Bone Cyst</td>
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<td><em>David Limbrick, M.D., Ph.D., St. Louis, MO</em></td>
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<td>8:30 AM-8:45 AM</td>
<td>Refractory Spinal PNET in a Child with Spina Bifida</td>
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<td><em>Naina L. Gross, M.D., Oklahoma, OK</em></td>
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<td>8:45 AM-9:00 AM</td>
<td>Avoidance of Postoperative Swan-neck Deformity in NF1 Pediatric Patients Following the Resection of Cervical Spine Tumors</td>
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<td><em>Mahmoud G. Nagib, M.D., Minneapolis, MN</em></td>
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<tr>
<td>9:00 AM-9:15 AM</td>
<td>Beverage Break</td>
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<tr>
<td>9:15 AM-10:45 AM</td>
<td><strong>GENERAL SESSION V: HYDROCEPHALUS I</strong></td>
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<td><em>Moderator: David F. Jimenez, San Antonio, TX</em></td>
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<tr>
<td>9:15 AM-9:30 AM</td>
<td>Hemiplegia after Shunt Revision</td>
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<td><em>Eric M. Jackson, M.D., Baltimore, MD</em></td>
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<tr>
<td>9:30 AM-9:45 AM</td>
<td>International Infant Hydrocephalus Study (IIHS): Initial Results of a Prospective, Multicentre Comparison Of Endoscopic Third Ventriculostomy (ETV) and Shunt for Infant Hydrocephalus</td>
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<td><em>Abhaya V. Kulkarni, M.D., Ph.D., Toronto, ON</em></td>
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<tr>
<td>9:45 AM-10:00 AM</td>
<td>Case Presentation: Low Pressure Hydrocephalus in a 10-year-old</td>
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<td><em>Susan R. Durham, M.D., Burlington, VT</em></td>
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<td>10:00 AM-10:15 AM</td>
<td>The Case of an Asymptomatic Fractured Shunt Catheter, to Repair or not to Repair?</td>
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<td><em>Stephanie L. Einhaus, M.D., Memphis, TN</em></td>
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**TUESDAY, February 2 (continued)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</table>
| 10:15 AM–10:30 AM | Combination of Ventricular Imaging and Thermal Shunt Flow Testing in Evaluation of Suspected Shunt Malfunction: A Prospective Operator-Blinded Multicenter Study  
*Joseph R. Madsen, M.D., Boston, MA* |
| 10:30 AM–10:45 AM | Developing a Rodent Model to Assess the Effects of Sports-Related Concussion on Cognition in Adolescents  
*Marike Zwienenberg-Lee, M.D., Sacramento, CA* |
| 10:45 AM–11:00 AM | Beverage Break                                                                          |
| 11:00 AM–11:15 AM | **International Masters Series Part 1**  
Endoscopic Endonasal Skullbase Surgery  
*Henry W.S. Schroeder, M.D., Ph.D., Greifswald, Germany* |
| 11:15 AM       | Introduction of ASPN President  
*Frederick A. Boop, M.D., Memphis, TN* |
| 11:15 AM–12:15 PM | **Presidential Address**  
The Art is Long  
*Alan R. Cohen, M.D., ASPN President, Boston, MA* |

**WEDNESDAY, February 3**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>6:45 AM–7:30 AM</td>
<td>Breakfast for Registered Physicians</td>
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<tr>
<td>6:45 AM–7:30 AM</td>
<td>Breakfast for Fellowship Program Directors</td>
</tr>
</tbody>
</table>
| 7:30 AM–9:30 AM | **GENERAL SESSION VI: ENDOSCOPY**  
*Moderator: Abhaya V. Kulkarni, M.D., Toronto, ON* |
| 7:30 AM–7:45 AM | Sealing a Burrhole After Endoscopic Procedures  
*Mark S. Dias, M.D., Hershey, PA* |
| 7:45 AM–8:00 AM | The Vanishing Brain—A Review of Chronic ETV Failure and CSF Underdrainage  
*Usiakimi Igbaseimokumo, M.D., Kansas City, MO* |
| 8:00 AM–8:15 AM | Physical vs. Virtual Reality ETV Simulators for Neurosurgical Training—Which is Better?  
*James M. Drake, M.D., Toronto, ON* |
| 8:15 AM–8:30 AM | Bimanual Endoscopic Surgery with Suction Attached to Endoscope  
*Sandeep Sood, M.D., Detroit, MI* |
| 8:30 AM–8:45 AM | Unzipping the Membrane of Liliequist—Key to ETV Success  
*Robert P. Naftel, M.D., Nashville, TN* |
| 8:45 AM–9:00 AM | Management of the Patulous and Redundant Third Ventricular Floor During ETV to Prevent Future Failure  
*Michael J. Burke, M.D., Corpus Christi, TX* |
| 9:00 AM–9:30 AM | **International Master Series Part II**  
Endoscopic Approaches to Intraventricular Lesions  
*Henry W.S. Schroeder, M.D., Ph.D., Greifswald, Germany* |
| 9:30 AM–9:45 AM | Beverage Break                                                                          |
| 9:45 AM–11:00 AM | **GENERAL SESSION VII: CHIARI**  
*Moderator: Gerald A. Grant, M.D., Palo Alto, CA* |
| 9:45 AM–10:00 AM | Chiari “Compression” Surgery  
*Paul A. Grabb, M.D., Kansas City, MO* |
**WEDNESDAY, February 3 (continued)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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</table>
| 10:00 AM–10:15 AM | Cervicomedullary Compression and Craniocervical Instability with Holo-Syringomyelia in an Infant with Chiari II Malformation  
Jeffrey P. Greenfield, M.D., Ph.D., New York, NY |
| 10:15 AM–10:30 AM | Use of 1.5 Tesla Intraoperative MRI for Determining Need for Duraplasty in Pediatric Chiari 1 Malformation Surgery: One Hundred Consecutive Surgeries  
John Honeycutt, M.D., Fort Worth, TX |
| 10:30 AM–10:45 AM | A Chiari with CSF Issues  
Mark D. Krieger, M.D., Los Angeles, CA |
| 10:45 AM–11:00 AM | Fourth Ventricular Outflow Stents in Reoperations for Chiari I Malformation for Persistent or Recurrent Syringomyelia  
R. Michael Scott, M.D., Boston, MA |
| 11:00 AM–11:15 AM | Beverage Break |
| 11:15 AM–11:45 AM | **Work Force Discussion**  
*Moderator: Frederick A. Boop, M.D., Memphis, TN* |
| 11:45 AM–12:15 PM | Business Meeting—Open to ASPN members only |

**THURSDAY, February 4**

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<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>6:45 AM–7:30 AM</td>
<td>Breakfast for Registered Physicians</td>
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</table>
| 7:30 AM–8:30 AM | **GENERAL SESSION VIII: HYDROCEPHALUS II**  
*Moderator: David P. Gruber, M.D., MBA, Spokane, WA*  
Sonic Window Cranioplasty: An Enabling Surgical Procedure to Optimize Management and Surveillance of Hydrocephalus and Cerebral Lesions  
Kim H. Manwaring, M.D., Orlando, FL |
| 7:45 AM–8:00 AM | A Passive, Non-invasive Method for Monitoring Intracranial Pressure and Shunt Function  
Carrie R. Muh, M.D., MS, Durham, NC |
| 8:00 AM–8:15 AM | A Challenging Case of Low Pressure Ventriculomegaly in a Post-Meningitis 21-month-old with Leukemia  
Jay Riva-Cambrin, M.D., Calgary, AB |
| 8:15 AM–8:30 AM | A Difficult Case of Low Pressure Hydrocephalus  
Philipp R. Aldana, M.D., Jacksonville, FL |
| 8:45 AM–8:45 AM | Beverage Break |
| 8:45 AM–9:00 AM | **GENERAL SESSION IX: TUMOR II**  
*Moderator: Gerald F. Tuite, M.D., St. Petersburg, FL*  
Surgical Management of Very Large Cervical and Anterior Neck Neurofibroma with Follow-up Imatinib  
Laurie L. Ackerman, M.D., Indianapolis, IN |
| 9:00 AM–9:15 AM | Spatial Genomic Heterogeneity in Diffuse Intrinsic Pontine and Pediatric Midline High-Grade Glioma: Implications for Diagnostic Biopsy and Targeted Therapeutics  
Charles B. Stevenson, M.D., Cincinnati, OH |
| 9:15 AM–9:30 AM | Hemorrhage after Pineal Tumor Surgery  
John S. Myseros, M.D., Washington, DC |
**THURSDAY, February 4 (continued)**

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<thead>
<tr>
<th>Time</th>
<th>Session</th>
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| 9:30 AM–9:45 AM | Delayed Post-Operative Blindness in a 16-year-old Male Following Resection of a Left Intraventricular Atrial Choroid Plexus Papilloma  
Luigi Bassani, M.D., Newark, NJ |
| 9:45 AM–10:00 AM | Neurosurgical Resection of Highly Vascular Midline Intracranial Tumors  
John A. Duncan, III, M.D., Ph.D., Woodside, CA |
| 10:00 AM–10:15 AM | Beverage Break             |
| 10:15 AM–11:15 AM | GENERAL SESSION X: CRANIOFACIAL                                |
| 10:15 AM–10:30 AM | “Close Calls in Craniofacial Surgery: Dodging bullets”  
Matthew D. Smyth, M.D., St. Louis, MO |
| 10:30 AM–10:45 AM | Outcomes of Patients with Unicoronal Craniosynostosis Treated by  
Endoscopic Strip Craniectomy  
Suresh N. Magge, M.D., Washington, DC |
| 10:45 AM–11:00 AM | Craniosynostosis Chiari and Anomalous Venous Drainage  
Ruth E. Bristol, M.D., Phoenix, AZ |
| 11:00 AM–11:15 AM | Patient Centered Analysis of Endoscopic Cranietomy with  
Postoperative Orthotic Therapy  
Nathan J. Ranalli, M.D., Jacksonville, FL |
| 11:15 AM–11:45 AM | 2016 Presidential Candidates: A Cast of Characters that Would Make George Lucas Proud  
Katie O. Oricco, J.D., Director, AANS/CNS Washington Office |
| 11:45 AM–12:15 AM | The Future of Board Certification in Pediatric Neurosurgery  
**Moderator: Alan R. Cohen, Boston, MA** |
| 12:30 PM–6:00 PM | *ASPN Golf and Tennis Tournaments—registration required |
| 6:30 PM–11:00 PM | *Gala Banquet and Cocktail Reception |

**FRIDAY, February 5**

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<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>6:45 AM–7:30 AM</td>
<td>Breakfast for Registered Physicians</td>
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<tr>
<td>7:30 AM–9:30 AM</td>
<td>GENERAL SESSION XI: EPILEPSY</td>
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</tbody>
</table>
| 7:30 AM–7:45 AM | Complete Sub-Sylvian Resection of the Insula: A Technical Pearl in Hemispherotomy  
Brent O’Neill, M.D., Denver, CO |
| 7:45 AM–8:00 AM | Functional Connectivity Signal Latency Predicts Laterality in Pediatric Medically-Refractory Temporal Lobe Epilepsy  
Manish N. Shah, M.D., Houston, TX |
| 8:00 AM–8:15 AM | Impact of Preoperative FMRI Localization on Central Lesional Epilepsy Surgery in Children  
Jean-Pierre Farmer, M.D., CMFRCS(C), Montreal, QC |
| 8:15 AM–8:30 AM | Hemiparesis and Lethargy after Anterior Temporal Lobectomy  
Gregory Albert, M.D., Little Rock, AR |
| 8:30 AM–8:45 AM | MRI-Guided Laser-Induced Thermal Therapy for Pediatric Temporal Lobe Epilepsy  
Scellig Stone, M.D., Ph.D., Boston, MA |
FRIDAY, February 5 (continued)

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<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tr>
<td>8:45 AM–9:00 AM</td>
<td>Massive, Life-Threatening Bleeding from Avulsion of a Large</td>
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<td>Vein from the Inner Superior Sagittal Sinus Controlled Using</td>
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<td>a Biodesorbable Plate</td>
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<td><strong>Gerald F. Tuite, M.D., St. Petersburg, FL</strong></td>
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<tr>
<td>9:00 AM–9:15 AM</td>
<td>Using Myelin Maps to Localize Epileptic Foci in Pediatric Focal Epilepsy</td>
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<td><strong>Dean Hertzler, M.D., Hollywood, FL</strong></td>
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<td>9:15 AM–9:30 AM</td>
<td>Reactivation of Herpes Simplex Virus Encephalitis Following</td>
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<td>Epilepsy Surgery</td>
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<td><strong>Angela V. Price, M.D., Dallas, TX</strong></td>
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<td>9:30 AM–9:45 AM</td>
<td>Beverage Break</td>
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<td>9:45 AM–11:00 AM</td>
<td><strong>GENERAL SESSION XII: CONGENITAL/OTHER</strong></td>
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<td><strong>Moderator: Robin M. Bowman, M.D., Chicago, IL</strong></td>
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<td>9:45 AM–10:00 AM</td>
<td>Cerebral Aspergillosis Abscesses in a Child with Acute Lymphocytic</td>
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<td>Leukemia: A Sub-Radical Surgical Approach Combined with Medical</td>
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<td>Treatment</td>
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<td><strong>Bruce A. Kaufman, M.D., Milwaukee, WI</strong></td>
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<td>10:00 AM–10:15 AM</td>
<td>Intracranial Hypotension and Hypertension Following Cranioplasty</td>
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<td><strong>Hal Meltzer, M.D., San Diego, CA</strong></td>
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<td>10:15 AM–10:30 AM</td>
<td>Expansion Histiogenesis for Calvarial Reconstruction in Occipital</td>
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<td>Encephalocele Repair</td>
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<td><strong>Jodi L. Smith, M.D., Ph.D., Indianapolis, IN</strong></td>
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<td>10:30 AM–10:45 AM</td>
<td>Predicting Spontaneous Recovery in Birth Brachial Plexus Injury:</td>
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<td>Analysis by Narakas Type and Early Active Movement Scale Scores</td>
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<td><strong>Michael D. Partington, M.D., St. Paul, MN</strong></td>
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<tr>
<td>10:45 AM–11:00 AM</td>
<td>“Butterfly Flaps” for Myelomeningocele Closure</td>
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<td><strong>Christina Notarianni, M.D., Shreveport, LA</strong></td>
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<tr>
<td>11:00 AM–11:15 AM</td>
<td>Beverage Break</td>
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<tr>
<td>11:15 AM–11:45 AM</td>
<td><strong>GENERAL SESSION XIII: CONGENITAL/OTHER cont’d</strong></td>
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<td><strong>Moderator: Scott Elton, M.D., Chapel Hill, NC</strong></td>
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<tr>
<td>11:15 AM–11:30 AM</td>
<td>Safe Use of Subdermal Needles for Intraoperative Monitoring During</td>
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<td>Intraoperative MRI</td>
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<td><strong>David F. Bauer, M.D., Lebanon, NH</strong></td>
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<td>11:30 AM–11:45 AM</td>
<td>Cervical Spondyloptosis in a 3-year-old Child with Goldenharr Syndrome</td>
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<td><strong>Stephanie Greene, M.D., Pittsburgh, PA</strong></td>
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<tr>
<td>11:45 AM</td>
<td>Meeting Adjourns</td>
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Ventricular Access Device Placement in the Fourth Ventricle to Treat Malignant Fourth Ventricle Brain Tumors

Authors: David I. Sandberg, M.D., Marcia L. Kerr, R.N.

Introduction
Ventricular access devices (VAD) are commonly placed into the lateral ventricle of the brain but rarely placed into other ventricular compartments. We describe technical aspects of VAD placement into the fourth ventricle for the purpose of treating malignant posterior fossa brain tumors with chemotherapy infusions.

Methods
Seven patients underwent posterior fossa craniotomy and placement of a catheter under direct vision into the fourth ventricle as part of a clinical trial to treat recurrent malignant posterior fossa tumors. The catheter was placed without passing through any brain parenchyma and then connected to a VAD placed subcutaneously at the inferior aspect of the incision. Three of the seven patients underwent simultaneous subtotal resection of a recurrent posterior fossa tumor, and one patient underwent simultaneous tumor biopsy. Chemotherapy (methotrexate) was administered into the fourth ventricle via the VAD in five of the seven patients.

Results
One patient had partial left-sided facial weakness that was attributed to resection of tumor close to the floor of the fourth ventricle, and the remaining six patients had no new neurological deficits after surgery. No new neurological deficits were caused by VAD placement or by chemotherapy infusions into the fourth ventricle.

Conclusions
A VAD can be safely placed into the fourth ventricle without damaging the brainstem or cerebellum. Attention to anatomical details specific to the fourth ventricle are important when placing a fourth ventricle VAD and when utilizing it to administer chemotherapy.
Posterior Transcallosal Approach for Pineal and Posterior 3rd Ventricular Pathology

Authors: Paul Klimo Jr., M.D., Rick Boop, M.D.

Introduction
There are many surgical approaches to the posterior third ventricle and pineal region, each with their associated advantages and disadvantages.

Objective
We present our experience with the posterior interhemispheric transcallosal approach and analyze the indications, technique and outcomes.

Methods
A retrospective study was conducted to identify and analyze all children and young adults who underwent the “posterior transcallosal approach” July 2010–March 2015. Perioperative data included patient demographics, signs and symptoms on presentation, tumor characteristics (type, origin, and size), complications, and clinical and radiographic outcome at final follow-up.

Results
Twenty-two patients were identified for 24 cases (11 female, 13 male) with a mean age of 10.5 (range 3–32 years). The most common tumor type was pineoblastoma (n=6). Ten patients underwent gross total resections; 11 underwent subtotal; 2 tumors were biopsied. The intervenous operative corridor was used in 15 cases, the paravenous in 9. Of the 22 patients, 19 suffered 31 total postoperative events. There were 12 instances of contralateral weakness. Retraction-related hemiparesis was usually temporary; resection-related hemiparesis lasted longer. There were no complications related to occlusion of one or more bridging cortical veins or from thrombosis of one internal cerebral vein. Eight patients have died from tumor progression and of the remaining 14 patients; only one to date has developed local progression.

Conclusion
The posterior interhemispheric transcallosal approach allows resection of tumors located within the pineal region, posterior third ventricle, and thalamus. New postoperative neurologic deficits can occur; however, many will improve significantly or resolve completely over time.
Supracerebellar Transtentorial Approach to the Posterior Medial Temporal Lobe

Author: Sanjiv Bhatia, M.D.

Posterior medial temporal (PMT) region tumors arising in the posterior parahippocampal, fusiform and lingual gyrus, are challenging due to their deep-seated location between critical cisternal neurovascular structures, optic radiations and adjacent temporal and occipital cortex. Traditional approaches require temporal or occipital transgression, retraction, or venous sacrifice. These approaches can result in unintended complications that should be avoided. The supracerebellar transtentorial (SCTT) approach to this region has been described as an effective alternative that offers a direct route to the posterior fusiform and lingual gyrus of the temporal lobe while avoiding these complications. We report our experience in the pediatric population and discuss the feasibility, safety and efficacy of this approach using a modified lateral parkbench position.

All six patients with tumors in the posterior medial parahippocampal, fusiform and lingual gyrus were operated using this approach. Preoperative studies included a volumetric MRI of the brain, relevant functional imaging and diffusion tensor imaging to assist with intraoperative neuronavigation and track the optic radiations. All patients underwent a complete resection of the tumor and have been seizure free since the surgery. None of the patients had a postoperative visual field deficit or any other complication.

The author will discuss the relevant surgical anatomy, operative technique, present the clinical data and demonstrate a short video of the operative procedure.
Lateral Oblique Position for Combined Occipital Transtentorial and Infratentorial Supracerebellar Approaches to Large Pineal Region Tumors

Author: Andrew B. Foy, MD

Pineal region tumors present a significant surgical challenge to the pediatric neurosurgeon due to the deep location and critical neural and vascular structures in the region. A variety of surgical approaches to the pineal region have been described. We present our experience using the lateral oblique position to approach pineal region tumors. This patient position allows the surgeon access for both an occipital transtentorial and infratentorial supracerebellar approach to the pineal region during a single operative procedure. As well, this approach allows for excellent operative exposure of the pineal region with limited brain retraction, minimizes the risk of air embolism associated with the sitting position and improves surgeon comfort during long operations to resect tumors from this region. We present an illustrative case of a large pineal region tumor that was completely resected from a combined occipital transtentorial and infratentorial supracerebellar approach with the patient in the lateral oblique position.
Treatment of Cabergoline Resistant Pituitary Macroadenoma

Authors: James Felker, Briana Patterson, Anna Janss, David Wrubel, M.D.

This is an 8 y/o female who presented with eyelid swelling. CT and MR revealed a lesion in the left cavernous sinus and sella. Endoscopic biopsy was performed which was consistent with prolactinoma. The patient was treated for a year with increasing doses of cabergoline for over a year. There was progressive increase in the size of the lesion as well as a progressive elevation of the blood prolactin level. After debating the next appropriate treatment course, it was decided to try temozolomide, as the location of the lesion precluded a complete resection and we were trying to avoid radiotherapy. Over the course of the next year, there has been a dramatic drop in prolactin levels and lesion size. Temozolomide use in treatment refractory prolactinomas in adults has been reported. This is the first case reported in the pediatric population.
Is Neurofibromatosis Type I a Neurosurgical Disease?

Author: Eric Trumble, M.D.

As RVU production becomes an ever-increasing means by which neurosurgeons are re-imbursed, neurosurgical care has become increasingly focused on the operative suite. There are currently 47 Children’s Tumor Foundation certified neurofibromatosis clinics in the US. Of those 47, only 1 has a pediatric neurosurgeon as a director. Most have geneticists as directors. Since I became director of our NF clinic, our patient population has grown from <25 to >300(second largest in the nation, after Boston Children’s, per CTF). Balancing patient care and optimal resource utilization is difficult. For discussion, I will present 4 cases of patients known to have NF-1.
Feasibility and Clinical Application of Magnetic Resonance Fingerprinting

Authors: Peter de Blank, M.D., MSCE; Mark Griswold, Ph.D.; Andrew Sloan, M.D.; Vikas Gulani, M.D., PhD; Chaitra Badve, M.D.; Jeffrey Sunshine, M.D.; Barbara Bangert, M.D.; Gregory Russell, M.D.; Duncan Stearns, M.D.; Deborah Rukin Gold, M.D.; Krystal Tomei, M.D., MPH

Notes:
Increased Radiosensitivity with Histone Methyltransferase Inhibitors in Pediatric High Grade Glioma

Authors: Dombrowski, S.M.\(^1\), Abou-Antoun, T.\(^2\), Mansour, A.\(^3\), Houghton, P.\(^5\), Recinos P.F.\(^1\), Violette Recinos, M.D.

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Notes:
An AVM in an Addict with Auditory Abnormalities

Author: Saadi Ghatan, M.D.
Real-time Ultrasound-guided Catheter Guided Navigation for Approaching Deep-seated Brain Lesions

Authors: R. Michael Scott, M.D., Edward R. Smith, M.D.

Introduction
Deep-seated brain lesions can be difficult to approach. Even with frameless stereotaxy, brain shift may impair accuracy and repeated confirmation of the trajectory adds time to the case. Dissection along a desired route can be complicated by absence of identifiable landmarks deep to the cortisectomy, increasing risk of unintended injury to neural tissue should deviation from the intended path occur.

Objective
We describe a quick and safe method to approach deep-seated brain lesions using real-time intraoperative ultrasound to place a catheter to the lesion margin as a guide for the dissection trajectory.

Methods
Retrospective review of cases, including radiographic, pathologic and intraoperative data.

Results
From 2005-2012, full data sets were available for 12 lesions in 11 patients approached using this technique. Ten lesions were tumors and 2 were cavernous malformations. Lesion locations included: thalamus (4), trigone (3), mesial temporal lobe (3), and other deep white matter (2). Catheter placement was successful in all patients and median time required for the procedure was 3 minutes (range 2–5 minutes). There were no complications related to catheter placement. The median diameter of surgical corridors on post-resection MRI was 6.6 mm (range 3.0–12.1 mm).

Conclusions
Use of real-time ultrasound-guidance to place a catheter to aid in dissection to a deep-seated brain lesion provides advantages complementary to existing navigational techniques, such as frameless stereotaxy, ultrasonography without catheter use and simple microdissection. The catheter insertion technique described in the present study provides neurosurgeons a quick, accurate and safe method for reaching deep-seated lesions.

Acknowledgement
William Chadduck, Children’s National Medical Center
Challenging Case: A 10-year-old Boy with a Brain Stem Tumor

Author: Catherine A. Mazzola, M.D.

Introduction
A 10-year-old boy presented to the emergency department with headaches and intermittent esotropia for three years, nausea and vomiting for one week, and a recent MRI done at another hospital showing a large tumor of the fourth ventricle (ependymoma by report) and obstructive hydrocephalus. The child was admitted to Goryeb Children’s Hospital and taken for surgical resection of the tumor.

Method
The surgery was uneventful. A posterior fossa craniotomy was done with intra-operative monitoring. The caudal aspect of the tumor lifted easily off the floor of the fourth ventricle, but at the superior or cranial aspect, the tumor was attached to the floor of the fourth ventricle. There was a residual rim of tumor left purposefully. Post-operatively, the patient was left intubated for a post-op MRI brain the next morning with plans to extubate. Despite “normal” intra-operative electrophysiological studies, the child did not “wake-up” normally.

Results
Post-operative MRI showed good tumor resection, but with edema extending from the upper mesencephalon into the hypothalamus. Modafinil was started and a prolonged course of steroids were utilized. Within 24 hours of starting modafinil, the child “woke-up” but did have persistent oculomotor palsies. Within three months the child was able to walk unassisted, but with ataxia, dysarthria and persistent cranial neuropathies. Pathology revealed juvenile pilocytic astrocytoma.

Conclusion
Post-operative MRI done three months after surgery was concerning for an enlarging area of post-operative enhancement. The decision was made to follow conservatively. A MRI done six months after surgery showed an even larger area of enhancement. Conservative treatment has been recommended by pediatric neuro-oncology; and although surgical resection is not advocated by the pediatric neurosurgeons, we do suggest commencing chemotherapy at this time.
A Systems Engineering Approach to Reducing Intrathecal Baclofen Pump Surgical Complications

Author: Shenandoah Robinson, M.D.

Introduction
Intrathecal baclofen pumps are prone to surgical complications due to the medical complexity of children and young adults with severe cerebral palsy and issues inherent to implanting a device. Systems engineering can be used to evaluate the work system comprised of the technology, tasks, organization, people and physical environment to optimize processes and improve patient outcomes. We hypothesized that work system improvements could be used to reduce surgical complications related to intrathecal baclofen pump insertion.

Methods
The peri-operative process from the time of patient referral for evaluation through post-operative follow-up was assessed and optimized to reduce work flow errors. Peri-operative complications will be discussed in this context.

Results
Complications rates and points of improvement will be presented.

Conclusions
Procedures at high risk of post-operative complications may be amenable to structured process approaches to care delivery.
Quality Improvement and Increased Value from Implementation of a Multidisciplinary Care Pathway for Craniosynostosis Surgery

Authors: Sandi Lam M.D. MBA, Robert Dauser M.D., I-Wen Pan Ph.D., Thomas Luerssen M.D.

Introduction
Craniosynostosis is a complex condition treated with surgery. Many patients benefit from evaluation and care by multiple subspecialty services. We implemented a multidisciplinary care pathway at our institution to reduce variation and for quality improvement. The goals were to improve patient-centered care by streamlining preoperative workup, minimizing operative time, improving perioperative communication, and unifying postoperative care.

Methods
We developed and implemented a care pathway with evidence-based best practices where available. Metrics pre- and post-implementation of the multidisciplinary care pathway were examined with review of institutional medical records and cross-referencing with the Children's Hospital Association Pediatric Health Information System (PHIS) database. Consecutive cases from the pre-intervention year (2013) and from the post-intervention year (2014) were retrospectively reviewed.

Results
We demonstrated measurable improvements after implementation of the multidisciplinary care pathway. The rate of blood transfusion was lowered by 30%. Mean length of hospital stay decreased by 25%. Corresponding median and average charges per craniosynostosis surgery hospitalization at our institution decreased from $77,655 and $66,294 in 2013 to $44,667 and $61,138 respectively in 2014. Case mix was similar between the pre-intervention and post-intervention years, with a 30% increase in case volume in the latter year.

We compared our program to national benchmarks in PHIS for the years 2013 and 2014. Adjusting for case mix, our patients’ average length of stay post-intervention was reduced to 47%ile among the national multicenter cohort (68%ile prior). Complication rates remained at 3%.

Conclusion
Implementation of a multidisciplinary care pathway for our craniosynostosis surgery program has led to increased value of care, with measurable decrease in rates of blood transfusion, length of stay, and overall hospital charges.
C1-2 Instability from Os Odontoideum Mimicking Intramedullary Spinal Cord Tumor: Report of Two Cases

Author: Richard C. E. Anderson, M.D.

Os odontoideum is a common cause of atlantoaxial instability in the pediatric population. Two cases are presented whose initial clinical presentation and MRI were suggestive of an intramedullary neoplasm. One patient underwent surgery for resection of a presumed neoplasm. The ultimate diagnosis in both cases was cervical spine instability and cord injury from os odontoideum. Difficulty in making the correct diagnosis and subsequent clinical management will be discussed.
Neurofibromatosis Type 1: 
The Case of the Disappearing Spine

Author: Francesco T Mangano, DO

We present a case of an 11-year-old boy with NF-1 and significant cervical spine findings including spondyloptosis, intramedullary spinal cord tumor, intradural extramedullary spinal cord tumors, and cervical instability with a normal neurologic examination. He has undergone several surgical procedures over the past 7 years including resection of cervical tumors, and anterior and posterior cervical decompression and fusion. Most recently his imaging has demonstrated significant resorption of the bony spine with impending instability. Discussion will focus on current status and whether any further treatment is warranted or possible.
Postoperative Quadriplegia Following Spinal Cord Decompression: Implications for Intraoperative Monitoring

Author: Douglas L. Brockmeyer, M.D.

The case is presented of a 2 ½-year-old girl with a severe upper cervical congenital vertebral anomaly with spinal cord compression. After initial successful decompression and fusion, bony regrowth occurred resulting in further severe cord compression. Repeat decompression resulted in dense quadraparesis despite the use of intraoperative electrophysiologic monitoring. The implications of false negative IOM findings in spinal surgery are discussed.
More Complicated than A-B-C: 
A Formidable Cervical Aneurysmal Bone Cyst

Author: David D. Limbrick, Jr., M.D., Ph.D. and Neill Wright, M.D.

Case
An 11-year-old female presented for evaluation of 1-2 months of neck pain and several days of pain and paresthesias in her shoulders. CT and subsequent MRI showed a circumferential, erosive lesion of C4 with kyphosis and canal stenosis. She underwent resection of the lesion with C3-5 stabilization from a posterior approach, followed by C4 corpectomy and anterior C3-5 fusion. The pathology returned as aneurysmal bone cyst (ABC). Three months later, she developed severe recurrent neck pain and was found to have massive recurrence of her lesion, with involvement of C2, C3, C5, and C6, encasement of her vertebral arteries, and spinal cord compression. She underwent posterior resection with extension of her fusion from occiput to T3. A tracheostomy was performed, followed by a radical neck dissection and C3 and C5 corpectomies with C2-C6 anterior fusion. Her pathology again returned as ABC (telangiectatic osteosarcoma ruled out); however, due to local aggressiveness of the lesion, she received wide-field radiotherapy. Six months post-radiation, her ABC remains stable.

Conclusion
While histologically benign, ABCs are neoplasms and are capable of aggressive local recurrence, even in the absence of malignant transformation.
Refractory Spinal PNET in a Child with Spina Bifida

Author: Naina Gross, M.D.

Patient is now a 7yo female with a very complicated history. It started at birth, 34 week twin gestation, with a lumbosacral myelomeningocele that was closed and vps placed. At 3months the patient had a Chiari decompression at another institution. At 3yo (June 2011), she had arm and leg symptoms and a shunt revision was performed (again different institution). The symptoms continued and MRI revealed spinal masses. She was transferred back to my care and a debulking in the cervical and lower thoracic spine was done. Metastatic PNET was found without any mass intracranially. Patient underwent chemotherapy and stem cell transplant. Despite laminoplastic laminotomy in the cervical spine, she progressed with swan neck deformity. A 2 level ACDF was done in December 2012. She completed therapy and was being followed per protocol without evidence of recurrent disease. However, we noticed a progressive syrinx and CSF bleb at thoracic site consistent with tethering. Her shunt was checked and found to be functioning; January 2014, I went in for an untethering procedure starting at the thoracic site and found spinal cord coated with melanocytic tumor. She underwent further chemotherapy and radiation for the recurrent PNET. She has been off therapy since July 2014. Her syrinx has continued to slowly progress, and she is slowly showing neurologic deterioration. I have offered to place a syringopleural shunt as I do not know of any other option.
Avoidance of Postoperative Swan-neck Deformity in NF1 Pediatric Patients Following the Resection of Cervical Spine Tumors

Author: Mahmoud G. Nagib, M.D.

The present communication relates to the author’s experience with the high incidence of postoperative cervical spine deformities in NF1 pediatric patient’s with cervical spine tumors. Two illustrative cases will be presented. Despite the use of cervical osteoplastic laminectomy and external immobilization, the patients developed severe swan-neck deformities requiring cervical reduction, fusion and instrumentation as well as halo vest immobilization for a period of 12 weeks. Both selected patients have been followed postoperatively for a period of 36 months.

Patient #1:
The patient was an 8-year-old female who underwent a cervical laminoplasty for an intradural extramedullary schwannoma extending from C2 in C5. Over the ensuing six months, despite wearing a hard collar, the patient developed a progressive severe swan-neck deformity extending from C2-C6.

Patient #2:
The patient was 12 years old. A cervical laminoplasty was completed at the C2-C3 level with a resection of an intradural extramedullary neurofibroma. The patient developed a recurrence at the same side five months later. The tumor was again resected. The dural closure was quite tenuous. A lumbar drain was placed. Over the ensuing eight weeks a severe swan-neck deformity developed despite the hard collar.

Issues of concern:
1. Should the halo vest be used as part of the first procedure?
2. In addition to the halo vest immobilization, should the posterior and anterior cervical spine instrumentation or both be done at the same time as the initial surgery or shortly thereafter.
Hemiplegia after Shunt Revision

Author: Eric Jackson, M.D.

Notes:
International Infant Hydrocephalus Study (IIHS): Initial Results of a Prospective, Multicentre Comparison of Endoscopic Third Ventriculostomy (ETV) and Shunt for Infant Hydrocephalus

Authors: Abhaya V. Kulkarni, M.D., PhD (Hospital for Sick Children, Toronto, Canada); Shlomi Constantini, M.D. (Tel Aviv, Israel); Spyros Sgouros, M.D. (Athens, Greece); for the IIHS Investigators

Introduction
The IIHS is an international, prospective, multicentre study to compare ETV and shunt in infants (<24 months old) with symptomatic triventricular hydrocephalus from aqueductal stenosis. Recruitment started in 2004 and, here, we present the first results of IIHS.

Methods
IIHS utilized a prospective comprehensive cohort design, which contained both a randomized and non-randomized arm. Patients received either an ETV or shunt, based on randomization or parental preference. Patients were followed prospectively for time to treatment failure, defined as the need for repeat CSF diversion procedure (shunt or ETV) or death due to hydrocephalus. Survival analysis was used to compare time to failure for ETV versus shunt. The trial was registered at clinicaltrials.gov (NCT00652470).

Results
A total of 158 patients met eligibility criteria (median age at surgery 3.6mths, IQR 1.6-6.6 mths) across 27 centres in 4 continents. Since only 52 patients (32.9%) were randomized, all 158 patients were analyzed together (115 ETV, 43 shunt). Actuarial success rates for ETV vs shunt at 3, 6, and 12 months were: 68% vs 95%, 66% vs 88%, and 66% vs 83%. The 6 month ETV success rate of 66% was slightly higher than would have been predicted by the ETV Success Score (57%). The hazard ratio for time to treatment failure favored shunt over ETV (3.17, 95% CI 1.45-6.96, p=0.004), after adjusting for age at surgery, history of previous hemorrhage or infection, continent, and randomization status. Patients younger than 6 months of age appeared to do relatively worse with ETV than older patients.

Conclusions
The IIHS has provided the first prospective direct comparison of ETV and shunt for infant hydrocephalus. These initial results suggest that shunting has a superior success rate compared to ETV, although the success rate for both was relatively high. This patient cohort continues to be followed and we will await the results of the important primary outcome of health status at 5 years of age.
Case Presentation:
Low Pressure Hydrocephalus in a 10-year-old

Authors: Susan R. Durham, M.D., Adam Strand, M.D.

RH is 10-year-old female s/p resection of a cerebellar JPA at the age of three. She had a right frontal VPS (Strata 2.0) placed during the post-operative period. At that time, an ETV was performed with a NeuroPen. She remained clinically and radiographically stable with small, decompressed ventricles until February 2015 when she presented with headaches and ventriculomegaly. We performed an uneventful proximal catheter and valve revision, replacing her Strata valve with a Delta 2 due to the need for reprogramming after MRI. Post-operatively, she was very slow to awaken and imaging demonstrated further increase in ventriculomegaly. She was taken emergently to the OR and the entire shunt replaced. She continued to be quite somnolent and a left frontal EVD was placed. Initial ICP ranged from -1 to 1 mmHg and sub-atmospheric drainage over a course of two weeks was required to decrease ventricular size. We then revised the ETV and performed a complete shunt revision with placement of a CERTAS valve (no antisiphon) set initially at 4. We elected to leave the EVD clamped in order to measure ICP. Over the course of a week, we slowly turned up the CERTAS valve to 7 (near off) and she had clinical and radiographic improvement. At three month follow up, she is doing well with stable ventricular size.

Low pressure hydrocephalus remains poorly understood. Symptomatic improvement and decreased ventricular size in response to prolonged subatmospheric drainage has been considered the cornerstone of management. Few studies have examined alternative treatment options, either to avoid the risks associated with prolonged external ventricular drainage or due to failure of traditional methods. ETV appears to be a strong alternative treatment option and should be considered in cases of LPH although there is little evidence to support its use in the literature.
The Case of an Asymptomatic Fractured Shunt Catheter, to Repair or Not to Repair?

**Author:** Stephanie Einhaus, M.D.

17-year-old morbidly obese patient with a VP shunt since birth associated with a myelomeningocele. No previous revisions. Was noted one year prior to have an asymptomatic shunt fracture in the neck, stable ventricular size, and a decision was made to observe. In retrospect, the fracture had been present for 4 years. He lived 3 hours away, and his transportation was poor. He returned to spina bifida clinic a year later with a few headaches, untreated known hypertension, unchanged stable ventricles, and no papilledema or optic atrophy. Shunt externalization was recommended to see if the patient’s shunt was still working and if would tolerate a clamp trial. The shunt was found to still be working when externalized. It was clamped, and he was observed for 3.5 days. No headache, no papilledema, slight increase in ventricular size after the first day only. His shunt was subsequently tied off distal to the valve. He is now 1.5 years post shunt tie off with no changes.

**Comments**

The author has a series of 7 patients who were found to have asymptomatic shunt fractures, all of whom had never had a previous symptomatic shunt revision. They were externalized, and underwent a clamp trial. Four children tolerated the clamp trial and had their shunt tied off or removed. The author suggests that a “wait and see” management strategy may not necessarily be in the child’s best interest. Families and medical providers often assume that the shunt is non-functional when it is chronically “broken” and thus may not take subsequent signs of shunt malfunction seriously, which can then lead to serious morbidity or even death. This management paradigm in a specific subset of patients is beneficial by either avoiding the morbidity of a symptomatic shunt failure, or allowing the definitive determination of shunt independency.
Combination of Ventricular Imaging and Thermal Shunt Flow Testing in Evaluation of Suspected Shunt Malfunction: A Prospective Operator-Blinded Multicenter Study

Author: Joseph R. Madsen, M.D. for the Shunt Flow Study Group

Introduction
We evaluated the diagnostic value of thermal shunt flow detection (SC) in ventriculoperitoneal shunts, enhanced by a micro-pumper (MP) to enhance flow. Specifically, we wished to know whether SC/MP plus ventricular imaging improved diagnostic precision over imaging alone.

Method
Thermal flow detection and ventricular imaging by CT or MRI were obtained in 263 symptomatic patients < 29 years old at ten centers. Clinicians, blinded to the results of the SC/MP test, tabulated whether radiographic studies showed ventricular enlargement, and whether surgery was performed over the next week for obstruction. The diagnostic utility of ventricular imaging alone, and the combination of SC/MP plus imaging, were calculated as both positive and negative predictive values (PPV and NPV).

Results
Imaging alone had a positive predictive value of 71.0% (44/62 cases, 95% confidence interval 58.7-80.8%). SC/MP, when concordant and positive (flow not confirmed, with ventricular enlargement) showed a PPV of 88.6% (39/44 cases, C.I. 76-95%). Of 91 patients with both studies were negative (flow confirmed and no ventricular enlargement), zero went on to surgery (NPV 100%, C.I. 95.9-100.0%). For imaging alone, the NPV was 92.5% (186/201, C.I. 88.1 to 95.4%). The improvement in PPV of 17.7% (C.I. 8.1-27.2%) is significant, as is the improvement in NPV of 7.46% (C.I. 3.83 to 11.1%). The 91 patients who had concordant reassuring studies (with the radiographic studies only available to the clinical team) went on to have 25 hospital admissions for observation, 5 lumbar punctures, 3 shunt taps, and 2 radionuclide flow studies—but no shunt revisions.

Conclusion
The combination of radiographic ventricular imaging and thermal flow detection by SC/MP improves diagnostic power of shunt malfunction and shunt patency. The combination of tests may improve efficiency of diagnosis for some patients and diminish the need for hospital admission and additional invasive tests.
Developing a Rodent Model to Assess the Effects of Sports-Related Concussion on Cognition in Adolescents

Authors: Marike Zwienenberg-Lee, M.D., Lauren Ekman, Angela Avitua, Haroon Shafique, and Gene G. Gurkoff

Introduction
Many traumatic brain injuries (TBI) occur in the young adults and are often associated with sports-related concussions. Cognitive disorders from concussion can have a significant and lasting impact.

Few models are available to systematically study the effects of concussion in immature animals. We have developed an in vivo brain injury model that produces a pattern of cognitive injury suitable to study concussion. This study describes our findings.

Methods
To generate injury, a metal disk was glued to the skull and impacted with an electrically driven piston at 2 or 5 m/s. The metal disk acts as a helmet to diffuse force across the skull, modeling a concussive injury without skull fracture.

To determine age-related differences in cognitive outcome, early (PND35) and mid-adolescent (PND55) rats were assessed on post-injury days 4–8 in the Morris water maze (MWM).

NeuN immunohistochemistry was utilized to label neurons in brain slices through the ipsilateral hippocampus and parietal cortex. Viable neurons in each region of interest were quantified.

Results
We used 49 male PND35 and 20 PND55 male Sprague-Dawley rats. All rats rapidly learned the spatial learning task. The model produced a consistent injury. A 5 m/s injury was associated with a significant impairment in spatial learning in PND35 but not in PND 55 rats. Learning impairment recovered 7 days post-injury. Neurons remained viable after injury.
Conclusions
An age related response to injury was noted with a less favorable response in older animals. Learning impairment occurred in the absence of significant neuronal cell death.

Our model produced a consistent and reproducible learning impairment, similar to older rats with TBI and neuronal death, but with recovery at a much faster rate.

It is critical to develop models of sports-related injury as this is the largest and fastest growing population of mild pediatric TBI.

Notes:
Sealing a Burrhole After Endoscopic Procedures

Authors: Mark S. Dias, M.D., Brian Anderson, M.D.

Cerebrospinal fluid (CSF) leakage from post-operative surgical wounds following endoscopic third ventriculostomy (ETV) or other endoscopic procedures in children with hydrocephalus is a frustrating complication, requiring wound re-suturing or revision, CSF infection, or declarative failure leading to shunt insertion. Techniques to close these wounds to prevent CSF leakage have not been discussed.

We recently treated a patient with myelomeningocele and shunt malfunction, performing an ETV. Although the patient’s symptoms resolved, there was intermittent post-operative CSF leakage that persisted despite wound re-suturing. At reoperation, rather than re-inserting a shunt, we decided to seal the burrhole with a piece of Alloderm dermal graft held in place by a titanium burrhole cover. The patient had no leak from the wound subsequently, despite clinical deterioration from significantly elevated intracranial pressure that ultimately required a ventricular shunt. We wish to use this case report to stimulate a discussion about ways to minimize post-operative CSF leakage following endoscopic procedures.
The Vanishing Brain—A Review Of Chronic ETV Failure and CSF Underdrainage

Author: Usiakimi Igbaseimokumo, M.D.

Introduction
The preference for endoscopic third ventriculostomy over shunt placement when both are applicable is justified by the life-long burden of shunt dependency. However the persistent ventriculomegaly with possible progressive neurocognitive deficits for the child is as alarming as the burden of shunt dependency. A consecutive series of patients with chronic CSF underdrainage including ETV failures is presented.

Method
An institutional review board approved retrospective study of shunt survival was carried out and the subset of patients with chronic CSF underdrainage, who had “elective” CSF diversion were reviewed for this paper. Chronic underdrainage was defined as patients with patent ETV on MRI with flow studies who continue to have mild symptoms or require special assistance in school. Shunted children with similar clinical presentation whose ventricles remain large were also included.

Results
There were 33 children (24 males) and the mean age was 2.3 years (range 0 – 18 years). The mean CSF opening pressure was 20 cm CSF (range 6 – 46cm CSF). The CSF pressure in new shunt placements was higher than the mean pressure in the shunt revision operations -20.8 versus 16.5 cm CSF respectively.

Conclusion
Although a fairly small sample, it is apparent that intracranial pressure is a poor marker of neuronal well-being as there was a very wide range of pressures in patients needing new shunt placement or revision. Therefore a more sensitive index of the success or failure of CSF diversion that can capture the neurocognitive deficits is needed rather than using the time to the “next operation” as the sole index of success or failure.
Physical vs. Virtual Reality ETV Simulators for Neurosurgical Training—Which is Better?

Authors: James Drake, M.D., Gerben Breimer, Faizal Haji, Vivek Bodani, Melissa Cunningham, Adriana–Lucia Lopez–Rios, Allan Okrainec.

Introduction
Simulators are being increasingly utilized in surgical training, but there is no consensus on the best system design. This study compares and identifies the relative utilities of two physical and virtual reality (VR) endoscopic third ventriculostomy (ETV) simulators—the Sickkids ETV physical simulator—validated for content and assessment, and the Virtual Reality NRC Neurotouch—with imbedded metrics.

Methods
Twenty-three neurosurgical residents and three fellows performed an ETV on both the physical and virtual reality simulators. Participants rated the models using 5-point Likert scale questions evaluating the domains of anatomy, instrument handling, procedural content and the overall fidelity of the simulation. Paired t-tests were performed for each domain's mean overall score and individual items.

Results
The VR model scored higher for realism of the intraventricular anatomy (4.5 ±0.7 vs. 4.1 ±0.6, p= 0.04) and third ventricle floor (4.4 ±0.7 vs. 4.0 ±1.0, p= 0.03), although the overall anatomy score was similar (4.2 ±0.6 vs 4.0 ±0.6, p= 0.11). The Physical simulator outperformed the VR simulator for overall instrument handling (4.5 ±0.5 vs. 3.7 ±0.8, p< 0.01) and procedural content (4.2 ±0.6 vs. 3.9 ±0.8, p= 0.03). Overall task fidelity across the two simulators was not perceived as significantly different. The approximate purchase cost of the VR simulator was several orders of magnitude greater than the Physical one.

Conclusions
Each model has advantages and disadvantages and selection for use can be goal and cost driven. Training focused on learning anatomy or decision making for anatomical cues may be aided with the VR simulation model. A focus on developing manual dexterity and technical skills using neuroendoscopic equipment in the operating room would be better learned on the physical simulation model.
Bimanual Endoscopic Surgery with Suction Attached to Endoscope

Author: Sandeep Sood, M.D.

The inability to effectively dissect or control hemorrhage in surgery performed using a channeled endoscope has resulted in evolution of a “three handed” technique, wherein the endoscope is held in a holder or by an assistant while the surgeon performs the procedure using standard microsurgical techniques. The disadvantage is that every time the field of surgery has to change, the endoscope has to be moved to a new position. This can be somewhat tedious and frustrating in long operations. In addition, crowding of instruments through a small opening often results in an irritating instrument “scissoring”. We have circumvented this problem by attaching a suction to the endoscope for performing endoscopic surgery using a micro-craniotomy. In this “bimanual” technique, the endoscope with attached suction is used in the left hand and the right hand uses micro-instruments for dissecting or cutting in the standard fashion. The technique allows for tissue handling and dissection in a manner similar to surgery with a microscope with additional advantage of a small incision, better visualization and a greater magnification. Video presentation will show the validity of this technique which we have used in operations on pineal tumors through sub-torcular micro-craniotomy, intraventricular and thalamic tumors, trans-spheniodal pituitary lesions and more recently for interhemispheric corpus callosotomy and hemispherotomies using 3D endoscopes.
Unzipping the Membrane of Liliequist—Key to ETV Success

Author: Robert P. Naftel, M.D.

Endoscopic Third Ventriculostomy with Choroid Plexus Cauterization (ETV-CPC) has introduced a younger population and new etiologies of hydrocephalus to potential endoscopic management of their hydrocephalus. In this population new challenges have been noted. One challenge has been fenestrating the membrane of Liliequist in children with spina bifida. After opening the floor of the third ventricle, the surgeon will often be anterior to the membrane of Liliequist or the membrane will be thick and difficult to widely fenestrate. Additionally, these myelomeningocele patients with ETV failure, often it is found that this membrane has scarred closed after a small fenestration. A technique for performing a large vertical fenestration of the membrane of Liliequist using the flexible scope anterior to the membrane and the Bugby wire (without cautery) posterior to the membrane to “unzip” the membrane will be presented. While not all ETV procedures will require this technique, it has been used in 6 cases with myelomeningocele and to date none have failed (mean follow-up 7 months).
Management of the Patulous and Redundant Third Ventricular Floor During ETV to Prevent Future Failure

Author: Michael Burke, M.D.

A patulous and distended floor of the third ventricle as seen with chronic hydrocephalus can be difficult to obtain an adequate perforation and can seal in a delayed fashion leading to recurrent symptoms.

The following is a technique adopted by the author to avoid such future failure.

Standard approach is taken for the procedure. The third ventricular floor is perforated with a micro blunt probe. The patient is then given a Valsalva maneuver which is held and balloons the floor superior into the third ventricle and away from the underlying basilar artery. A bipolar probe on low settings is introduced and gently tapped against the ballooned floor. This results in a progressive shrinkage and repositioning of the floor to its normal position and removing any previous redundancy. Once back to the normal position the floor is then reperforated or ballooned open as per the surgeon’s Technical preference.
Chiari “Compression” Surgery

Author: Paul A. Grabb, M.D.

16-year-old girl presented with worsening nystagmus and gait imbalance. Magnetic resonance imaging (MRI) showed a Chiari one malformation with a pB-C2 of 7.0 mm, tonsillar descent of 12 mm, and clival axial angle (CXA) of 120 degrees. She was noted to have an occipitalized atlas and no abnormal motion on flexion and extension. She underwent Chiari decompression.

Her symptoms worsened a month postoperatively. MRI and flexion/extension studies showed no complications with pB-C2 (7.0 mm), CXA (119 degrees), good dorsal decompression, and no instability. Hard collar immobilization markedly improved symptoms.

She was placed prone in a neutral position and underwent occipital cervical fusion and instrumentation. Postoperatively she had cervical pain out of proportion to what would be expected. She wore a hard collar. She refused to get out of bed. Postoperative day three she developed spastic quadriparesis and dysphagia. MRI showed posterior fossa crowding with flattening of the ventral brainstem. Her pB-C2 and CXA measured 7.9 mm and 113 degrees, respectively. She was taken immediately to the operating room for loosening of hardware, extension, and refixation. She awoke with only mild occipital cervical pain, and complete resolution of her quadriparesis and dysphagia. MRI showed dramatic improvement in posterior fossa crowding with pB-C2 of 7.0 mm and CXA of 124 degrees.

In follow up her nystagmus and gait symptoms and signs improved substantially.

With ventral compression and a reduced CXA, the surgeon must plan to extend the occipital cervical junction prior to final fixation. The extended position makes the approach, dissection, and screw placement difficult. Hence, this requires beginning in neutral for screw placement, then “breaking scrub” with head holder loosening and extension prior to final fixation.

Relatively small changes in the pB-C2 and CXA can have large clinical effects in these patients.
Cervicomedullary Compression and Craniocervical Instability with Holo-Syringomyelia in an Infant with Chiari II Malformation

Authors: Jeffrey P Greenfield, M.D. Ph.D., Roger Hartl, M.D., Ali Baaj, M.D., Mohammad Janjua, M.D.

In this case we will discuss the challenges in occipital cervical fixation in the extremely young population including how to evaluate instability in infants, indications for pursuing fixation, limitations in instrumentation, novel and unusual techniques to consider and risks of failure.

The patient a 1-year-old male, presented to my office several months after a multilevel cervical laminectomy (C1-C5) for Chiari II malformation with a very significant cerebellar herniation into the upper cervical spinal canal had been performed at another institution. He had undergone a myelomeningocele repair and ventriuloperitoneal shunt prior to the laminectomy. He presented to me with the inability to hold up his head, progressively worsening respiratory distress requiring 24 hour supplemental oxygen and feeding difficulties. His immediate distress was resolved by an emergent shunt exploration which demonstrated a proximal malfunction, but residual concerns over severe cervicomedulary compression and suspected occipito-cervical instability persisted and led to the series of procedures we will discuss.

We will also discuss this case within the context of learning how to prevent CCI from occurring in the setting of severe occipital-cervical decompression requiring surgery at a very young ages and discuss how addressing instability may result in future significant limitations in approaches to the cervicomedullary junction to address recurrent or residual areas of clinically significant compression.

Radiographic issues including scoliosis, syringomyelia, brainstem herniation, medullary kinking, basilar invagination, tonsillar descent, craniocervical angulation and ventral brainstem compression will be discussed. Multiple complications including halo failure due to cortical bone thickness, skin integrity issues with occipital constructions, prolonged bracing and managing feeding and airway issues will be addressed.
Use of 1.5 Tesla Intraoperative MRI for Determining Need for Duraplasty in Pediatric Chiari 1 Malformation Surgery: One Hundred Consecutive Surgeries

Authors: John Honeycutt, M.D., Richard Roberts, M.D., and David Donahue, M.D.

Introduction
Appropriate operative techniques to address Chiari 1 malformations, especially need for duraplasty, is much debated. We present 100 consecutive patients who underwent high-field intraoperative MRI (iMRI) imaging during their surgery seeking to assess need for duraplasty

Methods
An IRB approved retrospective review was performed on our first 100 Chiari 1 patients undergoing Chiari I decompression in our 1.5 Tesla iMRI suite. After patients are brought to our iMRI suite and positioned appropriately for surgery after induction of general anesthesia, baseline MRI is performed with sagittal T1/T2 images and a CINE flow study. After bony decompression and thinning and/or splitting of the dura, MRI is repeated and compared to the baseline scan. After comparing images, the surgeon elects either duraplasty or simply closes the incision.

Results
Forty-five females and 55 males (55%) with an average age of 9 years old underwent surgery. Seventy-two patients had some degree of syringomyelia, while 28 patients did not. Seventy-two patients did not require duraplasty (as determined by the surgeon’s interpretation of MRI findings) while 28 patients required an expansile duraplasty (i.e. patch). Of the 28 patients with no syrinx, 4 required reoperation for failed first surgery (no improvement of symptoms): 1 with previous duraplasty (12.5% reoperation rate); and 3 without previous duraplasty (15% reoperation rate). Twenty syrinx patients required reoperation due to no improvement in syrinx: 1 for previous duraplasty (5% reoperation rate); and 19 for no previous duraplasty (37% reoperation rate). No major complications were associated with use of iMRI.

Conclusion
Employing iMRI to assess need for duraplasty during pediatric Chiari 1 malformation surgery is safe, and has reduced utilization of duraplasty in our institution by 50%. Although iMRI increases operating room time, information yielded by this test allows the surgeon to accurately predict when duraplasty is necessary in patients without syrinx. Patients harboring a syrinx may be less easily assessed by this test.
A Chiari with CSF Issues

Author: Mark Krieger, M.D.

Notes:
Fourth Ventricular Outflow Stents in Reoperations For Chiari I Malformation for Persistent or Recurrent Syringomyelia

Author: R. Michael Scott, M.D.

The author reviewed his personal operative database from January 1, 1987 through June 30, 2015 to assess the results of treatment of those patients under age 21 who underwent a reoperation for recurrent or residual syringomyelia associated with Chiari I malformation in which a fourth ventricle to cervical subarachnoid space stent was placed, and in whom there was at least 5 years of both radiologic and clinical follow-up. The clinical and operative notes of each patient were reviewed to determine those factors associated with the need for reoperation, and to record any operative complications. The results of surgery in terms of syrinx decompression were assessed by a review of pre- and post-operative MRI studies.

17 patients were found who fulfilled these search criteria, 10 females and 7 males ranging in age at reoperation from 2 to 20 years. There were 4 complications following these operations: 3 patients in whom stents had to be removed because of wound complications, each patient having had multiple prior surgeries and significant co-morbidities, and one neurologic deficit unrelated to stent placement (a unilateral upper extremity dorsal column deficit related to lysis of dense scarring around the spinal cord which had entrapped vasculature of the dorsal-lateral spinal cord). Inadequately treated or recurrent syringomyelia in this challenging group of patients responded very well to fourth ventricular stenting, with virtual disappearance of the syrinx in 12 patients, and marked reduction of syrinx size in 3, after an average follow-up of 9.9 years (range 5 – 19 years). The author’s indications for the use of fourth ventricular stents will be reviewed and operative pitfalls and technique discussed.
Sonic Window Cranioplasty: An Enabling Surgical Procedure to Optimize Management and Surveillance of Hydrocephalus and Cerebral Lesions

Authors: Kim Manwaring, M.D.; Jotham Manwaring, M.D.; Harry VanLoveren, M.D.

Introduction
Diseases of neurosurgical interest in pediatrics typically require longitudinal surveillance by CT or MRI imaging. This is especially true of hydrocephalus and cystic lesions. While US imaging often suffices, it is no longer useful when the anterior fontanel (AF) closes. However, benefits of US include office based availability, low cost, real time, no need for sedation, and nonionizing energy. Further, contrast enhanced US has been recently adapted to facilitate tumor imaging. In this broad context, we have developed a cranial implant which is sonically transparent, rigid, and protective to the brain to facilitate timely and economic postsurgical care.

Methods
Two toddlers previously underwent recreation of the AF in the third year to facilitate management of complex, cyst forming hydrocephalus; 2 years later, cranioplasty was performed when the imaging-intense condition had resolved. On this success, 4 biocompatible implantable plastics and titanium mesh were investigated for optimal sonic transparency using conventional diagnostic US (3-12 KHz). A cranial window implant was selected consisting of a titanium annulus and polyethylene center, measuring 2 x 3 cm. The implant was evaluated in human cadaver cranium imaging as well as a porcine cranial model. The material was further tested over the AF of infants and over the dura at adult tumor resection.

Results
The cranial bench model showed effective real time endoscopic guidance, observation of balloon positioning and inflation, and heating. The sonic material minimally degraded an US image compared to scalp in the infant and dura at craniotomy, allowing recognition and measurement of ventricle size and tumor margins. Without an implant in toddlers, bregmatic craniectomy eventually resulted in a deep sunken anterior fontanel associated with headache and required cranioplasty. The construction provides broad protection over the 2 x 3 cm window.
Conclusions
Sonic window cranioplasty appears promising as a surgical method to provide protection to the brain while affording the benefits of ultrasound over an extended age range. While diagnostic imaging is likely the greater use, potential for therapeutic ultrasound is also afforded when the window is positioned in the cranium perpendicular and in close proximity to the target tissue.

Acknowledgement
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Notes:
A Passive, Non-invasive Method for Monitoring Intracranial Pressure and Shunt Function

Authors: Carrie R. Muh, M.D., MS, Cameron R. Dale Bass, Ph.D., Allison L. Schmidt, MS

Notes:
A Challenging Case of Low Pressure Ventriculomegaly in a Post-Meningitis 21-month-old with Leukemia

Authors: Jay Riva-Cambrin, M.D., Gallagher C, Hader W

Case Scenario
This case involves a 21-month-old girl who initially presented with low grade fever, hepatosplenomegaly, and lower extremity petechiae. The work-up made the diagnosis of standard risk acute lymphocytic leukemia (ALL) and she began induction chemotherapy. One week later she developed febrile neutropenia, seizures, and hyponatremia. She was started on Vancomycin, Piperacillin, and Tazobactam empirically for meningitis. At that time, she had a non-focal exam and a GCS of 6 and she required intubation and ventilation. An MRI demonstrated severe pachy- and leptomeningeal enhancement around the basal cisterns and moderate ventriculomegaly without transependymal edema or sulcal effacement.

Neurosurgical Intervention
Serial FAST MRs demonstrated progressive ventriculomegaly and without neurological improvement; therefore an EVD was placed. The opening pressure was 3 cm of H2O and the EVD was left open at 5 cm with minimal drainage. Serial MRs demonstrated basal ganglial infarcts, resolving enhancement, but further progression of ventriculomegaly asymmetrically with new and significant transependymal edema. The EVD was sequentially lowered to -15 cm with slight neurological improvement (GCS of 8) but worsening transependymal edema. Her neck was then wrapped with improvement of the GCS to 10 and spontaneous movements within 24 hours. Fast MR at 48 hours demonstrated a complete resolution of the transependymal edema, decrease in ventricle size and expansion the cortical subarachnoid space. EVD was successfully weaned to 5 cm without any clinical or radiological deterioration. She continues to be treated in our PICU while we attempt to slowly wean the EVD.
A Difficult Case of Low Pressure Hydrocephalus

Author: Philipp Aldana, M.D.

Notes:
Surgical Management of Very Large Cervical and Anterior Neck Neurofibroma with Follow-up Imatinib

Author: Laurie L Ackerman, M.D.
Spatial Genomic Heterogeneity in Diffuse Intrinsic Pontine and Pediatric Midline High-Grade Glioma: Implications for Diagnostic Biopsy and Targeted Therapeutics

Authors: Charles B. Stevenson, M.D., Lindsey Hoffman, Mariko DeWire, Rachid Drissi, Lionel Chow, Lili Miles, Cynthia Hawkins, Maryam Fouladi

Notes:
Hemorrhage after Pineal Tumor Surgery

Author: John S. Myseros, M.D.

The patient is a 10-year-old male who presented with symptoms of obstructive hydrocephalus. Initial imaging revealed a pineal region tumor. He underwent initial endoscopic tumor biopsy and third ventriculostomy, and based on the diagnosis of a mature teratoma, subsequent supracerebellar infratentorial surgery, all out an outside institution.

Upon presentation to us, he had anisocoria, bilateral upward gaze difficulty, and a functioning CSF shunt. Serial imaging after partial resection revealed progressive and significant tumor growth, despite a benign histology.

After consultation, the family decided to proceed with an interhemispheric, posterior transcallosal resection.

During surgery there was bleeding from the tumor, and the right internal cerebral vein was torn but repaired. After recurrent bouts of bleeding and having removed the central portion of the tumor, the decision was made to stop.

Prior to leaving operating room, the child was awakened, moving all his extremities, trying to sit up, reaching for his endotracheal tube (ET). He was extubated. Because of significant secretions and tongue swelling causing airway obstruction, he required re-intubation in the operating room.

In the intensive care unit, he again awoke, trying to sit up, reaching for the ET, coughing, and gagging. He was sedated for his safety, but 2 hours later remained sedated with little response to noxious stimuli. He was taken for emergency CT scan.

This revealed a large hemorrhage into the anterior portion of the tumor, with significant midbrain compression. Subsequently an MRI and MRV showed no stroke or loss of deep venous drainage, but significant edema, hemorrhage, and mass effect.

After 2 weeks he began to follow commands and went to a rehabilitation facility. He required a shunt revision. Since that time, he has awoken, is speaking, eating and walking independently. He still has residual tumor and new neurologic deficit, but continues to improve.
Delayed Post-Operative Blindness in a 16-year-old Male Following Resection of a Left Intraventricular Atrial Choroid Plexus Papilloma.

Author: Luigi Bassani, M.D.
Neurosurgical Resection of Highly Vascular Midline Intracranial Tumors

Author: John A. Duncan III, M.D., Ph.D.

Two pediatric patients are presented who underwent craniotomy for resection of highly vascular midline intracranial tumor. Both patients enjoyed significant post operative improvement in neurologic function and are both independent ambulators and able to carry on activities of daily living. This report will document surgical principles and techniques that are, in this author's hands, beneficial to a good surgical outcome for neurologically impaired patients with difficult vascular midline tumors.

Case 1
14-year-old Hispanic female who presented with several months of progressive nausea and clumsiness who was found on MRI to have a 4.0 x 2.8 solid intramedullary cervico-medullary mass determined to be a hemangioblastoma. Von Hippel Landau work up was negative. Vascularity was documented by pre resection cerebral angiogram. Family was counselled against surgery but within 12 months, the patient suffered intratumoral hemorrhage with IVH and acute hydrocephalus. She was emergently treated by placement of external ventricular drain. Child represented intubated with near complete tetraplegia capable of voluntary movement of her right thumb only. She underwent midline posterior fossa craniotomy and gross total resection of solid hemangioblastoma.

Case 2
17-year-old Asian male who presented with many month history of progressive ataxia, motor weakness, intermittent headache and fatigue. A MRI brain showed a massive 5.7 x 4.6 x 5.4 cm midline mass most consistent with meningioma. Patient became non ambulatory over next 2-3 months and was found on exam to have dysarthric speech, appendicular ataxia R>L, dilated right pupil, asymmetric gag to the left and tongue deviation to the right. A cerebral angiogram showed a highly vascular tumor, most consistent with meningioma. He underwent a right temporal craniotomy, followed by a staged left far lateral craniotomy for near complete resection of meningioma.
“Close Calls in Craniofacial Surgery: Dodging bullets”

Author: Matthew D. Smyth, M.D.
Outcomes of Patients with Unicoronal Craniosynostosis Treated by Endoscopic Strip Craniectomy

Authors: Suresh N. Magge, M.D., Aparna Sajja, BS, Gary F. Rogers, M.D., John S. Myseros, M.D., Chima O. Oluigbo, M.D., Robert F. Keating, M.D.

Introduction
Unicoronal craniosynostosis (UCS) results in craniofacial deformities including recessed forehead, orbital dystopia, and angulation of the nose and face. This condition traditionally has been treated with bifronto-orbital advancement, but facial and nasal angulation can remain as a significant issue. Endoscopic strip cranietomy (ESC) and helmet therapy is being used more frequently to treat craniosynostosis. This study evaluated the change in fronto-facial asymmetry in infants with UCS who were treated with ESC.

Methods
This IRB-approved, retrospective study included 16 patients who underwent ESC and postoperative helmet therapy. Cranial anthropometric data was collected preoperatively and during follow-up visits after surgery. Pre-operative and follow-up photographs of patients were analyzed using ImageJ software. Craniometric analysis was conducted for forehead asymmetry (defined by difference of midline occipital to left frontal and midline occipital to right frontal measurements), nasal angulation, and facial angulation.

Results
The mean follow-up was 30 months. In the ESC patients, mean nasal tip angulation improved from 12.4 degrees preoperatively to 4.3 degrees at follow-up (p<0.01). Mean facial midline angulation improved from 4.8 degrees preoperatively to 1.5 degrees at follow-up (p<0.01). Forehead asymmetry improved by 60 percent in the first 11 months after ESC, and by an additional 4 percent at 30 months post-surgery (p<0.05). The greatest improvement in anthropometric measurements, particularly the recessed forehead, was noted at approximately 11 months after surgery.

Conclusions
Our study provides evidence of statistically significant improvement of forehead asymmetry, nasal angulation, and facial angulation in patients who underwent ESC followed by helmet therapy.
Craniosynostosis Chiari and Anomalous Venous Drainage

Author: Ruth E. Bristol, M.D.

Notes:
Patient Centered Analysis of Endoscopic Craniectomy with Postoperative Orthotic Therapy

Authors: Aaron Wallender, DDS, M.D., Nathan J. Ranalli, M.D.

Introduction
Major advantages of the endoscopic-assisted craniectomy with postoperative molding orthosis approach to the treatment of craniosynostosis compared to the traditional total calvarial vault reconstruction include decreased operative time, shorter hospital stay, a reduced rate of blood product transfusion and lower overall cost with equivalent long term calvarial reconfiguration results. A significant limitation of this minimally invasive technique is the fact that affected children are generally considered ineligible for the procedure beyond six months of age. As such, early detection of craniosynostosis by neonatologists and pediatricians, and subsequent timely referral to a specialist is critical. At present, there is a paucity of qualitative data regarding patient barriers to diagnosis and treatment. In this study we aimed to investigate family perspectives on the evaluation and management of their children with craniosynostosis with goals of improving the rate of early detection and establishing a patient-centered treatment protocol.

Methods
We utilized a quasi-qualitative dynamic questionnaire applied to parents of our patients with craniosynostosis treated with endoscopic craniectomy and postoperative helmeting structured to allow for responses to be graded on a Likert rating scale. Analysis also involved a retrospective review and detailed description of this patient population.

Results
Qualitative data derived from the questionnaire was divided into 5 categories: quality of education (QE), preoperative quality of life (prQOL), postoperative quality of life (poQOL), quality of hospital care (QH), and the standard of care (SOC). The initial diagnosis was made by non-pediatricians in more than 60% of cases. The assessment of prQOL and QH demonstrated high numerical values. The SOC evaluation revealed positive feedback regarding interactions with the orthotist and the child’s overall tolerance of the helmet. The poQOL assessment reported a positive family and public perception of their child in the helmet. Criticisms included challenges obtaining an initial referral to pediatric neurosurgery and the absence of a formal division-sponsored family support group during treatment.
Conclusions
This information improves awareness of potential barriers to diagnosis and
treatment for families of this unique patient population. Future endeavors include
applying a modified questionnaire to our open vault reconstruction patients and
to our regional referring pediatricians in an effort to further define and combat
obstacles to the early detection and treatment of craniosynostosis.

Notes:
Complete Sub-Sylvian Resection of the Insula: A Technical Pearl in Hemispherotomy

Authors: Brent O’Neill M.D. and Michael Handler M.D.

Introduction
A 6-year-old girl with intractable epilepsy and right hemiparesis was referred for hemispherotomy. Imaging showed extensive encephalomalacia of the left hemisphere with minimal damage to the right frontal lobe, thought to be a result of abusive head injury. The patient was adopted from a foreign orphanage, so early history is not known. The left insula is involved with the encephalomalacia.

A left perisylvian hemispherotomy was performed, closely resembling the description by Schramm (Neurosurgery 1995) and Villemure (Neurosurgery 1995) with the addition of insular removal by a technique that we have termed complete sub-Sylvian resection.

Method
Sub-Sylvian insular resection consists of direct aspiration of the insular grey matter beneath the Sylvian arachnoid. This Sylvian arachnoid and middle cerebral artery (MCA) branches along with the overlying operculum are progressively elevated from posterior to anterior and superior to inferior until the insula is completely resected. The MCA trunk is then ligated allowing en-bloc removal of the Sylvian arachnoid and overlying frontal and temporal tissue.

Results
Between 2003 and 2013, 75 patients underwent hemispheric surgery for epilepsy at a large pediatric hospital. 32 had peri-insular hemispherotomy without formal resection of the insula, all prior to 2010. 40 patients had peri-insular hemispherotomy with sub-Sylvian insular resection. Three had another technique (excluded). The insular resection group trended toward better seizure outcome at one year post-operatively (83% vs 75% seizure free) and fewer complications (25% vs 44%). Neither of these differences is statistically significant. The rate of hydrocephalus was identical between the two groups. The sub-Sylvian group had shorter operative times and lower volume of blood transfusion.

Conclusion
Sub-Sylvian insular resection is a safe, straightforward adjunct to peri-insular hemispherotomy that may improve completeness of insular resection and epilepsy outcome.
Functional Connectivity Signal Latency Predicts Laterality in Pediatric Medically-Refractory Temporal Lobe Epilepsy

Authors: Manish N. Shah, M.D., Anish Mitra, BA, Manu S. Goyal, M.D., MS, Abraham Z. Snyder, Ph.D., M.D., Joshua S. Shimony, M.D., Ph.D., David D. Limbrick, M.D., Ph.D., Marcus E. Raichle, M.D., Matthew D. Smyth, M.D.
Impact of Preoperative FMRI Localization on Central Lesional Epilepsy Surgery in Children

Authors: Jean-Pierre Farmer, M.D., Roy Dudley, M.D., Jeffrey Atkinson, M.D.

Childhood Epilepsy is frequently lesional in nature and extra temporal in location, mostly in the central region. Several intraoperative techniques exist to localize the central sulcus. However, establishing the anatomical relationship of the lesion to the central sulcus through a non-invasive technique such as FMRI preoperatively can provide valuable planning information. Furthermore, an accurate localization of fibertracts based on FMRI data will provide accurate guidance during the subcortical dissection of these cortically based lesions. The FMRI localization can be done with passive finger or toe movements in lightly anesthetized children reflecting either motor movement or proprioceptive information both of which correlate with the central sulcus localization.

We present the case of a 17-year-old avid guitar player with a central ganglioglioma and nocturnal seizures where accurate FMRI based localization of both the primary central area and corticospinal projections in relation to the tumor helped establish the risk of injury preoperatively and helped obtain a safe resection without affecting the patient’s musical abilities. Correlations with intraoperative phase reversal somatosensory evoked potential localization of the central sulcus appeared excellent in this and an additional 7 cases. Availability of this information as an integral part of the navigational plan helps guide safe central resections in medically refractory epilepsy cases in children. Ultimately, relying exclusively on FMRI localization (without SSEP correlation) might allow for smaller and shorter craniotomies.
Hemiparesis and Lethargy after Anterior Temporal Lobectomy

Author: Gregory Albert, M.D.

Introduction
This right handed 9-year-old female presented with medically refractory epilepsy. After extensive evaluation and discussion at our multidisciplinary epilepsy conference, she underwent invasive epilepsy monitoring and subsequent right anterior temporal lobectomy, amygdalohippocampectomy, and interior temporal gyrus topectomy. Both surgeries were uneventful intraoperatively. However, she awoke from the second stage operation with left hemiparesis, lethargy, and short-term memory difficulties.

Method and Results
A head CT showed only expected postoperative changes. Brain MRI/MRA revealed right ICA vasospasm without infarction. Angiography was performed which confirmed the vasospasm. The vasospasm initially responded to intra-arterial nicardipine. However, her symptoms recurred. At this point, HHH therapy was started and continued for 6 days. Her symptoms improved during this time and she had only subtle motor deficits at the time of discharge. At follow-up four months after surgery, she had no neurological deficits. Other than one seizure early in the course of her vasospasm, she has remained seizure free.

Conclusion
Symptomatic vasospasm is well-known to neurosurgeons as a potentially devastating consequence of subarachnoid hemorrhage. However, its occurrence after anterior temporal lobectomy is rarely reported (Mandonnet, et al. 2004).
MRI-Guided Laser-Induced Thermal Therapy for Pediatric Temporal Lobe Epilepsy

Author: Scellig S.D. Stone, M.D., Ziev B. Moses, Joseph R. Madsen, M.D.

Notes:
Massive, Life-Threatening Bleeding from Avulsion of a Large Vein from the Inner Superior Sagittal Sinus Controlled Using a Bioresorbable Plate

Authors: Gerald Tuite, M.D., Carolyn Carey, M.D.

Introduction
Massive subdural bleeding was encountered after dural opening during routine exposure for periinsular hemispherotomy in a 1-year-old boy. Shortly after the dura was opened around the limited craniotomy, before any brain resection commenced, the surgical field filled with dark blue venous blood. It was quickly determined that a large draining vein had avulsed from the inner portion (meningeal layer) of the posterior 1/3 of the superior sagittal sinus, far from the craniotomy and dural opening. The bleeding could be stopped with compression by a surgeon’s finger or by direct compression using cottonoid and surgicel. However, as soon as compression was removed, massive bleeding ensued and the patient’s blood pressure quickly plummeted.

Method
Ligation of the sinus was not felt to be a viable option because of the risk of stroke to the contralateral hemisphere in this posterior sinus injury. Direct repair with a flap of falx or adjacent dura did not seem feasible based on the rate of bleeding that would be expected during such a maneuver. Instead, a bioresorbable plate was fashioned to allow persistent compression of hemostatic agents against the hole in the sinus, allowing the surgeon to remove his finger or instrument. The resorbable plate was fixated to the skull and bent in such a way that it would pass intradurally and directly compress hemostatic agents on the inner portion of the superior sagittal sinus.

Results
By utilizing this technique, the operation was safely terminated, his superior sagittal sinus remained patent on postoperative CT venogram, and his contralateral hemisphere remained intact.

Conclusion
We are unaware of previous descriptions of this surgical maneuver, which we believe helped us avoid a catastrophic outcome.
Using Myelin Maps to Localize Epileptic Foci in Pediatric Focal Epilepsy

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Introduction
Pediatric focal epilepsy can be a challenge to control medically but, conversely, it is often amenable to surgical treatment. Patients with the highest surgical success rates have clearly definable lesions. Therefore, lesion localization is intimately linked with overall outcomes and quality of life for these patients. Current magnetic resonance imaging (MRI) studies have focused upon standard sequences (T1-weighted, T2-weighted, fluid attenuated inversion recovery (FLAIR)), diffusion tensor imaging (DTI) and cortical thickness to help define epileptic foci. All of the above have shown changes in white matter in focal epilepsy, but none have the specificity to evaluate just myelin. We describe the utilization of a multicomponent relaxometry technique (MCR) to create myelin water fraction (MWF) maps to better quantify and analyze myelination in pediatric focal epilepsy.

Methods
Thirteen pediatric subjects with focal epilepsy received standard MRIs for epilepsy including T1, T2, and FLAIR sequences as well as the multi-component derived equilibrium single pulse observation of T1 and T2 (mcDESPOT) sequence for myelin. Patient history, EEG, and standard MRI were utilized to categorize the type and location of the epileptic foci. Myelin maps were derived from the mcDESPOT sequence and each subject was compared against a population-averaged myelin atlas. Standard regions of interest (ROIs) and white matter-specific ROIs were calculated. Analysis included ROI differences between WM regions as well as differences between left and right sides.

Results
Individuals with focal epilepsy showed decreased myelin corresponding to the side and location of epileptic foci as seen on traditional MRI, EEG or clinical history. This was best seen using white matter ROIs comparing left and right differences between study subjects and the control model.

Conclusions
This is the first study to demonstrate that children with focal epilepsy have decreased myelin corresponding to an epileptogenic focus.
Reactivation of Herpes Simplex Virus Encephalitis Following Epilepsy Surgery

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Introduction
Relapse of Herpes Simplex Virus (HSV) encephalitis following successful antiviral therapy is uncommon but well described. It is more frequent in children and usually occurs within 3 months of initial infection. Later relapse is rare. A case of reactivation of HSV encephalitis triggered by epilepsy surgery 16 years after initial infection is reported, and similarities to previous case reports are reviewed.

Methods
A case of recurrent HSV encephalitis following right frontal topectomy for intractable epilepsy is presented with review of the literature.

Results
A 19-year-old woman with prior HSV encephalitis at age 3 years developed refractory frontal lobe epilepsy (10-20 seizures/day). After 7 days of invasive monitoring with subdural electrodes, right inferior frontal gyrus topectomy and MST of surrounding area was performed. She was seizure-free until postoperative day (POD) 10 when she presented with fever, headache and CSF WBC=125 (68% PMN). MRI showed acute right frontoparietal infarction and small areas of restricted diffusion in left hemisphere. Mental status worsened with persistent fever despite IV vancomycin, ceftriaxone and open irrigation of surgical site. On POD 19 fever had resolved but MRI showed new areas of bilateral infarction, CSF WBC=10 (83% Lymph) and CSF PCR positive for HSV. Despite initiation of acyclovir there was extension of intracranial edema and patient expired on POD 25. Postmortem confirmed HSV encephalitis with positive virus immunostaining.

Conclusions
Epilepsy surgery may induce reactivation of HSV encephalitis in previously affected patients. The use of subdural electrodes, corticosteroids and surgical manipulation may have acted as triggers for reactivation in the current case. Diagnosis was complicated by the preceding invasive monitoring, which increased suspicion for bacterial infection, and by neuroimaging which suggested infarction rather than encephalitis. Length of time between original encephalitis and surgery does not appear to mitigate the risk for reactivation, as our case represents the longest reported interval between initial infection and reactivation. The poor outcome of these patients underscores the need for a high index of suspicion for herpes reactivation and early use of acyclovir in at risk postoperative patients. Prophylactic acyclovir should be considered in patients undergoing invasive monitoring and should be in the differential for causes of neurological deterioration following intracranial procedures.
Cerebral Aspergillosis Abscesses in a Child with Acute Lymphocytic Leukemia: A Sub-Radical Surgical Approach Combined with Medical Treatment

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Introduction
Brain abscesses in immunocompromised patients are increasing in frequency even though there is a decreasing frequency of cerebral abscesses in the general population. Many are fungal infections. Fungal brain abscesses in immunocompromised patients are mainly due to concurrent pulmonary infections with candida or aspergillus species. Fungal brain abscesses have a very high mortality rate – 40-80% even in immune-competent patients, and up to 95% in immune-compromised patients. Imaging of fungal abscesses in immune-compromised patients is non-specific, but often shows multiple abscesses in a vascular distribution, with associated vasculitis and stroke.

Method
The diagnosis is established with a biopsy or aspiration. Pharmacological treatment is necessary, but concurrent surgical treatment of the abscess improves survival. Sub-radical surgery has been shown to be better than radical/excisional surgery. Medical treatment has evolved with newer agents, such as voriconazole, that have better CNS penetration and less toxicity compared to amphotericin B, but dosing and pharmacokinetics are much different in children than in adults.

Results
This 6½-year-old girl, undergoing treatment for acute lymphocytic leukemia, was found to have a large right middle cerebral artery infarction with multiple ring enhancing lesions and cerebral edema. Aspergillus was found on biopsy. Over the course of 4 months she underwent three craniotomies with debridement and varying degrees of abscess resection, endoscopic ventricular fenestration for a trapped ventricle (but avoiding a shunt). She completed her chemotherapy and 3 years later had a cranioplasty. She is free of both leukemia and fungal brain infection more than 6 years after treatment.

Conclusion
The planning and choices involved in this sub-radical surgical approach to the multiple abscesses, the ventricular drainage, and the timing of cranioplasty will be reviewed, along with information on the associated medical treatment of aspergillus CNS infection in an immune-compromised child.
Intracranial Hypotension and Hypertension Following Cranioplasty

Author: Hal Meltzer, M.D.
Expnsion Histiogenesis for Calvarial Reconstruction in Occipital Encephalocele Repair

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Introduction
Encephaloceles are rare neural-tube defects that present as a skin-covered cystic sac protruding from the skull and result from herniation of neural tissue through a fusion defect in the bone. Prognosis depends on the size and contents of the encephalocele as well as associated syndromes, cerebral anomalies, and ease of surgical correction. Closure of large cranial defects often requires bone grafting after 6 months of age with split or full-thickness calvarial autografts. Such autografts, however, may have inadequate incorporation into the surrounding bone related to abnormal dura overlying the repaired encephalocele. Distraction osteogenesis is a procedure that uses an internal distractor system to move two segments of bone slowly apart in such a way that new bone fills in the gap. We have adapted this principle for expansion of the calvarium and associated soft tissues in a 2-month-old infant with a large cranial defect remaining after encephalocele repair.

Method and Results
Resorbable distraction devices were used for calvarial and scalp expansion on a 2-month-old female infant after repair of a complicated occipital encephalocele. Pre-operative and post-operative computed tomography (CT) scans of the head with 3D reconstructions were compared to evaluate ossification of the calvarium, coverage of neural structures, and change in intracranial volume. Such comparisons revealed improved intracranial volume and calvarial contour. There were no significant complications in the immediate post-operative period.

Conclusion
Expansion histiogenesis provides short-term successful coverage of neural structures and reduction of intracranial pressure after encephalocele repair. The calvarial expansion resulting from this technique decreases the extrinsic pressure on exposed intracranial contents and increases intracranial volume to accommodate herniated tissues in the case of large encephalocele defects.
Predicting Spontaneous Recovery in Birth Brachial Plexus Injury: Analysis by Narakas Type and Early Active Movement Scale Scores

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Introduction
Spontaneous recovery is common in children with birth brachial plexus injury (BPI), but persisting deficits are associated with significant disabilities. Study objective is to establish methods for earlier identification of those infants who will require interventions.

Method
Single center, IRB approved, retrospective study of a multidisciplinary brachial plexus clinic, using REDCap registry.

Results
From a clinic of approximately 600 patients seen since 1998, a study population was identified consisting of 191 patients with initial Active Movement Scale (AMS) assessments prior to 6 months of age, with at least 6 months follow-up. Sorted by Narakas type, 102 patients (53.4%) were Type 1 (C5-6 involvement), 65 patients (34.0%) were Type 2 (C5-7), 16 patients (8.4%) were Type 3 (C5-T1 without Horner) and 7 patients (3.7%) were Type 4 (C5-T1, with Horner). One patient had an isolated lower trunk injury. Spontaneous recovery occurred in 75.5% of Type 1 patients, 38.5% of Type 2 patients, 37.5% of Type 3 patients and none of the Type 4 patients. Analysis of AMS scores for elbow flexion at 3 months revealed that a functional score (AMS = 6 or 7) at this age correctly predicted avoidance of future intervention of any kind in Narakas 1 patients (OR 0.048, 95CI 0.044-0.430, vs patients with lower elbow flexion scores). In Type 2 patients, achieving functional elbow flexion by 3 months was also associated with a lower risk of needing intervention than those without good elbow flexion (OR = 0.105, p= 0.0094).

Conclusions
Spontaneous recovery decreases with increasing Narakas type, while early return of elbow flexion is confirmed to be predictive of avoiding the need for later interventions.
“Butterfly Flaps” for Myelomeningocele Closure

Author: Christina Notarianni, M.D.

Introduction
Dermal elements at the site of open spina bifida defects are poorly developed, resulting in very thin tissue at the site of placode closure. Furthermore, the tissue is widely displaced from the defect, making skin closure difficult and under tension. We present the use of the double keystone flap, a low tension, vascularized flap, as an alternative for skin closure.

Method and Results
A full term female infant was born with a large lumbosacral myelomeningocele and hydrocephalus. Apgars at birth were 1 and 1, respectively, with a birth weight of 2610 grams. Her head circumference was 32.5 cm with a full, soft anterior fontanelle and mild separation of her cranial sutures. A myelomeningocele was noted, starting at approximately L4 and measured approximately 4 x 5 cm. The baby was noted to have strong hip flexion and extension with slightly weaker knee flexion and extension. She had weak dorsiflexion of both feet, with her right leg weaker than her left. Cranial ultrasound revealed moderate hydrocephalus. Ventriculoperitoneal shunt placement followed by myelomeningocele closure was performed at one day of age. Neural placode and dural closure was performed in the usual fashion. Double keystone flaps were then mobilized. The size of each flap was 2.5 cm wide and 7 cm long. Flap elevation was performed to the level of lumbar fascia. Lateral portions of the flap were gently elevated toward the midline. The widest portions of the midline defect were closed first with interrupted mattress sutures. The lateral edges of our flaps were then closed in layered fashions. The baby was kept in a prone position for the next 10 days.

Conclusion
Use of the double keystone, aka “butterfly flaps”, closure allowed for a tension free midline closure over a large, wide placode with good overall cosmetic results.
Safe Use of Subdermal Needles for Intraoperative Monitoring During Intraoperative MRI

Authors: David F. Bauer, M.D., Darcey TM

Intra-operative monitoring (IOM) is often used to increase the safety of brain and spine operations. Intraoperative MRI (iMRI) has become more widely available, but there are no MRI compatible or conditional electrodes available for IOM during iMRI. Current standard of care is to remove all IOM electrodes prior to iMRI. If further surgery with monitoring is needed after the iMRI then needles are replaced under the sterile drapes, a procedure that is technically difficult, time consuming, and could cause increased risk of infection. We tested a subdermal needle electrode protocol for iMRI in pre-clinical melon and human volunteer studies, and then we validated our protocol in five patients undergoing elective operation requiring IOM and iMRI. In pre-clinical studies, needles outside the RF coil did not cause thermal injury. Needles within the RF coil have a potential for thermal injury if the leads are coiled or longer than 25cm. When leads within the RF coil were straight and truncated to 25cm prior to iMRI in 5 patients, no thermal injury or complications were observed. We believe this technique is safe for use in our iMRI machine. Site-specific testing is recommended prior to routine use at other facilities.
Cervical Spondyloptosis in a 3-year-old Child with Goldenharr Syndrome

Author: Stephanie Greene, M.D., Pittsburgh, PA

The patient was first encountered as a 9-month-old girl with a diagnosis of Goldenhaar syndrome. She has laryngomalacia, severe sensorineural hearing loss, a solitary left kidney, and torticollis, as well as a Sprengel deformity of the left shoulder. She has a visibly short neck, and is under the 3rd percentile for height and weight. Imaging of her spine reveals a congenital spondyloptosis, with C5 and C6 being positioned anterior to C7 and part of T1. She has partial fusion of C2 and C3, and a C5 hemivertebra. The vertebral arteries enter the foraamina transversarium at C6. She has spinal cord compression at the level of C5. She achieved her gross motor milestones in normal fashion. She has had no increased tone. At eighteen months of age, she developed scoliosis, with a 44 degree left thoracic curve from T5 to L1. The curve increased to 54 degrees at the age of 2, and she was placed in a TLSO. She was maintained in a Minerva brace from the age of 9 months until the age of 2.5 years, at which time she would no longer tolerate it fused to the TLSO. She has undergone every-three-month neurologic evaluations, and every-six-month MRIs. These have remained stable. Her scoliotic curve has stabilized at 66 degrees. She is now 3 years and 9 months of age. What treatment should she have for her congenital spinal dislocation, and at what age?
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Constitution and Bylaws of The American Society of Pediatric Neurosurgeons

Effective February 1, 2014

Vision Statement
The ASPN is committed to discovering, defining, and delivering the best care for patients with pediatric neurosurgical disease regardless of their age. We are further committed to dissemination of this information to all providers who care for these patients and to being the primary source of this information for physicians in training.”

ARTICLE I—Name and Objective

Section I:
The organization shall be called “The American Society of Pediatric Neurosurgeons.”

Section II:
The purpose of the Society shall be to improve the neurosurgical care of the children of the United States and Canada by advancing and advocating the specialty of Pediatric Neurosurgery.

The ASPN shall accomplish this goal by:

• Identifying individuals who meet its criteria for being Pediatric Neurosurgeons and show a continuing dedication to Pediatric Neurosurgery,
• Providing leadership in the identification and dissemination of the knowledge and the science of Pediatric Neurosurgery, including but not limited to conducting regular scientific meetings,
• Providing leadership in the education of all medical professionals, to include monitoring and ascertaining the appropriate neurosurgical care of patients with pediatric neurosurgical diseases (the Society recognizes that in some cases these disease processes start in childhood and extend throughout life),
• Providing guidance for the non-medical public, including pediatric neurosurgery patients and their families,
• Being an advocate for the child, on issues of importance to the neurological health of the child.
ARTICLE II—Membership

Section I: Election to Membership
A person becomes a candidate for membership in the Society when that person meets the criteria for eligibility and possesses the appropriate credentials, as stated in Article II, Section II—Membership categories.

Such individuals can identify themselves to the Society, or can be invited to apply for membership by the Executive Council.

The Membership Committee of the Society will be responsible for verifying the candidate’s eligibility and credentials.

These names will be sent to the Membership Committee of the Society at least one month prior to the annual business meeting of the Society, for subsequent submission to the membership as candidates for membership. At the annual business meeting, the members will then signify their acceptance of the candidate as a member by open vote. An affirmative vote of three-fourths of the members present at the annual meeting will carry the motion for membership. Defeat of the motion will not preclude repeat proposals for membership for that candidate.

Upon election to membership, the Secretary of the Society will inform the candidate. The candidate will indicate acceptance of membership by returning a signed statement indicating that he has reviewed the Bylaws of the Society and agrees to abide by the contents and decisions as they relate to his continuing membership in the Society.

Section II: Membership categories
The categories of membership shall be Active, Affiliated, Foreign, Senior, Honorary, Candidate, and Inactive.

Subsection A: Active Membership
A candidate for Active Membership must:

1. hold an unrestricted license to practice medicine in the United States of America, its territories, or one of the provinces of Canada and give proof of good professional standing
2. Be a neurological surgeon, certified by the American Board of Neurological Surgery, Inc., or The Royal College of Physicians and Surgeons (Neurosurgery) of Canada, and a resident of the United States of America, its territories, or Canada
3. have the recommendation of two members of the ASPN
4. Have a practice that is primarily Pediatric Neurosurgery, as demonstrated by meeting either:
   a. American Board of Pediatric Neurological Surgery (ABPNS) credentialing (if applying more than 2 years after ABPNS certification, submission of surgical logs documenting the following surgical experience will be required:
      • 75% of all operations on patients under 22 years of age; with a minimum of 85 operative cases
      OR
      • 125 operations in children under 13 years of age in each of the two years
   OR
   b. ASPN criteria:
      • Be at least 5 years after completion of an approved fellowship (Accreditation Council for Pediatric Neurosurgical Fellowships, Inc. —ACPNF)
      • the submission of surgical logs with the following experience in the two years prior to consideration for membership.
         – 75% of all operations on patients under 22 years of age; with a minimum of 85 operative cases
         OR
         – 125 operations in children under 13 years of age in each of the two years

Privileges of Active Membership include the ability to:
1. attend Society meetings with voting privileges
2. serve on committees with voting privileges
3. serve as an officer

Obligations of Active Membership include:
1. payment of dues
2. meeting attendance, not less than 1 out of every three annual meetings
3. possessing an unrestricted medical license, and maintaining good professional standing
4. maintaining a practice that is primarily Pediatric Neurosurgery, as stated above. To verify compliance, the Credentials and Membership Committee may request to review an operation log not sooner than every fifth year
5. Re-credentialing to maintain membership every 10 years
   a. either re-certification by the ABPNS OR by ASPN criteria
   b. if unable to meet re-certification requirements—the member may apply for AFFILIATED membership
Subsection B: Affiliated Membership
A new candidate for Affiliated Membership must:

1. hold an unrestricted license to practice medicine in the United States of America, its territories, or one of the provinces of Canada and give proof of good professional standing
2. Be a neurological surgeon, and a resident of the United States of America, its territories, or Canada
3. Have demonstrated leadership in Pediatric Neurosurgery—which can include clinical, teaching, research or administrative activities
4. have the recommendation of two members of the ASPN
5. be at least 5 years in practice

There can be no more than 20 Affiliated members (not including formerly Active members) in the Society at any time.

Active members who at the time of re-credentialing are unable to maintain Active requirements (ABPNS certification or ASPN criteria) may apply for Affiliated Membership, as long as they meet all the criteria above. There is no limit on the number of Active members who can become Affiliated members.

Privileges of Affiliated Membership include the ability to:
1. attend Society meetings with voting privileges
2. serve on committees with voting privileges

They cannot hold officer positions

Obligations of Affiliated Membership include:
1. payment of dues
2. meeting attendance, not less than one out of every three annual meetings
3. possessing an unrestricted medical license, and maintaining good professional standing
4. re-credentialing to maintain membership every 10 years by the same application process, and continuing to meet the above criteria.

Affiliated members can apply to become Active members at any time—by demonstrating that they meet the current requirements for Active membership.
Subsection C: Foreign Membership
A candidate for Foreign Membership must:

1. hold an unrestricted license to practice medicine in their country (non-United States/non-Canada) and give proof of good professional standing
2. Be a neurological surgeon, and not a resident of the United States of America, its territories, or Canada
3. Have demonstrated leadership in Pediatric Neurosurgery—which can include clinical, teaching, research or administrative activities
4. have the recommendation of one member of the ASPN
5. be at least 5 years in practice

There can be no more than 10 Foreign members in the Society at any time.

Privileges of Foreign Membership include the ability to:

1. attend Society meetings without voting privileges
2. serve on committees without voting privileges

They cannot hold officer positions

Obligations of Foreign Membership include:

1. exemption from payment of dues
2. exemption from meeting attendance rules
3. possessing an unrestricted medical license, and maintaining good professional standing
4. re-consideration by the Executive Council to maintain membership every 10 years, and continuing to meet the above criteria.

Subsection D: Senior Membership
Current Active or Affiliated members may become Senior members by request of the member after attaining the age of 60 years.

Privileges of Senior Membership include the ability to:

1. attend Society meetings with voting privileges
2. serve on committees without voting privileges

They cannot hold officer positions

Obligations of Senior Membership include:

1. exemption from payment of dues
2. exemption from meeting attendance rules
**Subsection E: Honorary Member**

From time to time, the society may wish to honor certain individuals for their importance to the development of specialty of Pediatric Neurosurgery, but who for one reason or another are not eligible for membership in the Society. It is not necessary for these individuals to be pediatric neurosurgeons.

Candidates for Honorary Membership should be proposed in writing by two active members to the Credentials and Membership Committee, who shall review the importance of the individual to Pediatric Neurosurgery and submit its recommendation to the Executive Council for review. If approved by the Executive Council, the name will be submitted to the membership by mail no later than one month prior to the annual meeting of the Society and voted on at that meeting. A two-thirds vote of the membership present is necessary for acceptance.

There may be no more than 5 Honorary Members of the Society who practice neurosurgery and who are under 65 years of age.

Privileges of Honorary Membership include the ability to:

1. attend Society meetings without voting privileges
2. serve on committees without voting privileges

They cannot hold officer positions

Obligations of Honorary Membership include:

1. exemption from payment of dues
2. exemption from meeting attendance rules—but Honorary members who are over age 60 and have not attended a meeting in five years will be automatically converted to Senior Membership status **without** meeting voting privileges

**Subsection F: Candidate Member**

1. hold an unrestricted license to practice medicine in the United States of America, its territories, or one of the provinces of Canada and give proof of good professional standing
2. be a resident of the United States of America, its territories, or Canada
3. Be a neurological surgeon, who has completed an approved pediatric neurosurgery fellowship (by the American Council of Pediatric Neurosurgery Fellowships)
4. have recommendations from two Active members of the ASPN, one of which is from their fellowship director
5. be at least one year out of fellowship
6. Have a practice that is primarily Pediatric Neurosurgery, as demonstrated providing a case log of his/her first 12 months in practice.
Privileges of Candidate Membership include the ability to:

1. attend Society meetings without voting privileges
2. serve on committees without voting privileges

They cannot hold officer positions

Obligations of Candidate Membership include:

1. payment of dues
2. exemption from meeting attendance rules
3. duration of membership in this category of no more than five years; it is anticipated that application will be made for Active or Affiliated membership when eligible or at the end of this time.

**Subsection G: Inactive Member**

Active, Affiliated and Foreign members who fail to fulfill the requirements for continuing membership in the Society may be automatically classified as inactive by vote of the Executive Council.

Active, Affiliated and Foreign members may request an inactive status because of cessation of primary practice of Pediatric Neurosurgery or long-term illness, or other reasons acceptable to the Executive Council upon review.

Once moved to Inactive Status, the inactive member will be notified by the secretary of the ASPN of his change in membership status by certified mail

An Inactive Member:

1. may not attend the annual meeting and is without voting privileges
2. may not serve on committees and is without voting privileges
3. may not hold office
4. will be exempt from dues

Inactive Members may request reinstatement by application to the Credentials and Membership Committee. Submission of materials demonstrating that they meet the criteria / requirements for Active, Affiliated or Foreign Membership shall be required for consideration of the request. Alterations in membership status shall require an affirmative recommendation from the Credentials and Membership Committee and approval by the Executive Council of the Society.

Upon reinstatement, the year of entry to the ASPN will be listed as the year of reinstatement.

**Section III: Membership Obligations**

Membership of the Society is a privilege not a right, and is contingent upon continuing compliance with the Articles of the Constitution and Bylaws as well as an active participation on the part of the members.
Continued **Active** and **Affiliated** membership will require compliance with the following:

- Attendance at 1 out of 3 annual meetings monitored in three-year intervals. Exception will require written request for excuse to be sent to the Executive Council through the Secretary who must approve it. Three consecutive absences without written excuse from the Executive Council will result in change to **Inactive** status. The Secretary will notify the member after the second unexcused absence of the implication of a third such absence.
- Payment of annual dues.

Continued **Active**, **Affiliated**, and **Foreign** membership will require compliance with the following:

- Continuing to meet the eligibility criteria for the membership status. To verify compliance, the Credentials and Membership Committee may request to review a member’s status not sooner than every fifth year.
- Good professional standing and maintenance of an unrestricted license to practice medicine in the United States or Canada or current country of residence.

**Section IV: Resignation**

Any member wishing to resign from the Society shall submit his resignation in writing to the Secretary, who shall present it to the Executive Council at the subsequent meeting of the Council.

**Section V: Expulsion**

All proposals for expulsion from the Society will be reviewed by the Executive Council. The member in question will be asked to resign after that Council’s finding of substantial reason and its majority vote for this action.

Expulsion from the Society may be proposed by any member, by presenting charges in writing to the Executive Council or the Executive Council as a whole may initiate expulsion proceedings upon its own recognition of a member’s default of failures as noted in Article II, Section IV.

Any member proposed for expulsion must be notified and provided with a listing of the charges against him at least three months before the Executive Council reviews and votes upon these charges, and he will be allowed to represent himself, either in person or by written response to the Executive Council’s review. He will then be excused from the Council’s final deliberations and vote, and he will be provided prompt written notification of the Executive Council’s action. If a member is asked to resign from the Society and he does not agree that this is appropriate, he may appeal to the membership at large, which will decide the issue by open vote at the next business meeting. A 75 % majority vote of members present will be required for expulsion.
ARTICLE III—Officers

Section I:
The officers of The Society shall consist of a President, President-Elect, Secretary, and Treasurer.

Section II:
The term of office for each shall be two years.

Section III:
The officers shall be elected by majority vote of The Society at its annual meeting and shall take office on the first day after conclusion of the annual meeting.

Section IV:
The President shall preside at all meetings of the Society as well as all meetings of the Executive Council. The President shall be an ex-officio member of all committees, and is empowered to appoint Ad-Hoc Committees who will report to the membership.

Section V:
The President-Elect shall act instead of the President, in the latter’s absence or inability to serve.

Section VI:
The Secretary shall keep a record of all meetings and notify candidates of their election to membership. He shall conduct the correspondence of the Society and send a written report of the proceedings of each meeting to each member. The Secretary will be responsible for providing the agendas for the Executive Council meetings as well as the annual membership meetings following consultation with the President. The Secretary shall keep a registry of members with the date of their election to membership. He shall notify the members at large of the location of the subsequent meeting one year in advance of that meeting.

Section VII:
The Treasurer shall collect and disburse the funds of the Society. He shall keep the financial statements, and send a statement of dues to the members and render an annual report to the Society.
Section VIII: Appointed officers
Appointed officers shall consist of an Annual Meeting Chairman, Parliamentarian, and Historian.

Subsection A—Annual Meeting Chairman
The Annual Meeting Chairman is responsible for site selection, all organization and conduct of the annual meetings for which that chairman is responsible, with the approval of the Executive Council.

Subsection B—Parliamentarian
The Parliamentarian shall be appointed by the President. The Parliamentarian shall be knowledgeable in matters of parliamentary procedure and shall advise the officers and members in such matters.

Subsection C—Historian
The Historian shall be appointed by the President with the approval of the Executive Council and serve at their pleasure. The Historian shall preserve the archives of the Society and shall from time to time, prepare a report at the request of the Executive Council.

Subsection D—Chair of the Joint Pediatric Section of the AANS and CNS
The Chairman of the Joint Pediatric Section of the AANS and CNS will be invited to serve as an “ex officio” member of the ASPN Executive Committee and participate in their deliberations as a non-voting member.

Section IX: Election of Officers.
The recommendations of the Nominating Committee will be presented to the Society at the Annual Meeting. Additional nominations will be solicited from the floor prior to voting on the election of officers. Voting for officers will be conducted separately for each office; voting will be conducted in such a fashion that a count of the tally for each nominee is determined. A secret ballot will be held if there is more than one nominee for a single office and such a ballot is requested by any two members. An absolute majority of votes cast is required for each office. If no candidate receives a majority of the votes cast, then a run-off election between the two candidates with the most votes will be held.
ARTICLE IV—Executive Council

Section I: Executive Council
The elected Executive Council of the Society shall be composed of its officers, its immediate past-President, and one member-at-large. The member-at-large is nominated by the Nominating Committee, voted upon by the membership, and serves a two-year term concurrent with the other members of the Executive Council.

The Executive Council shall meet at each annual meeting and at the discretion of the President at other times.

Section II:
The Executive Council shall levy assessments as deemed advisable. It shall appropriate money for necessary expenses. It shall make suggestions and recommendations to the Society as it deems fit in order to execute the purposes of this Society. The Executive Council shall recommend to the membership at large all members of the standing committees. The Executive Council will be empowered to provide an independent audit as it deems fit.

ARTICLE V—Committees

Section I:
The Standing Committees of the Society shall be as follows:

A. Bylaws Committee—shall consist of a Chairman and two additional members to serve two years. The Chairman of this committee shall be proposed by the Nominating Committee and elected by the membership at large. The other two members shall be suggested by the Executive Council and approved by the membership at the annual meeting. The Bylaws Committee will investigate proposed amendments to the bylaws and provide the membership with its recommendations at the meeting at which amendments are to be acted upon.

B. Education Committee—shall consist of a Chairman and two additional members to serve two years. The Chairman of this committee shall be proposed by the Nominating Committee and elected by the membership at large. The other two members shall be suggested by the Executive Council and approved by the membership at the annual meeting. The committee shall formulate and enact educational programs in Pediatric Neurosurgery.

C. Credentials and Membership Committee—shall consist of a Chairman and two at-large members to serve two years, and the immediate two past presidents. The Chairman of this committee shall be proposed by the Nominating Committee and elected by the membership at large. The two at-large members shall be suggested by the Executive Council and approved by the membership at the annual meeting.
Proposals for membership (new, reactivation, or status change) in the Society shall be submitted to the Credentials and Membership Committee who shall act in accordance with the provisions of Article II, Section II and determine the completeness, accuracy and that the appropriate criteria for membership have been met. Upon verification of the credentials of the candidate, not less than three members of the Credentials and Membership Committee shall formulate a recommendation to the membership of the Society one month prior to the annual meeting. All candidates with completed credentials shall be acted upon within one year of the date of receipt of the completed application.

D. Nominating Committee—shall consist of the three most recent past Presidents of the Society, the President-Elect of the Society, and two at-large members. The at-large members will serve for two years and be elected to the Nominating Committee at every other Annual Meeting. The Chairman of the Nominating Committee shall be the immediate past President of this Society. The Nominating Committee shall nominate candidates for each office, the member at large for the Executive Council, and the Chairman of each standing committee. The Nominating Committee shall report its recommendations to the Society at every other annual meeting. The two at-large members of the Nominating Committee will be determined at the Annual Meeting preceding the election of the officers and committee chairmen for whose nomination the committee will be responsible. Voting for these positions will occur as described for the election of officers. The two nominees with the most votes will become the at-large members of the committee. If a tie vote occurs such that two top nominees cannot be determined, a run-off election between the nominees involved in the tie will be held. The at-large members will begin their term at the end of the meeting at which they are elected.

C. Mission and Goals Committee—shall consist of the Executive Council and past Presidents of the Society and other members appointed at the discretion of the President. This committee shall convene at a minimum of once per year in addition to and not in conjunction with the annual business meeting. This committee shall convene at the recommendation of the President who will serve as committee Chairman. It shall be the duty of the committee to continually review the mission and goals of the Society. It shall recommend changes in the structure and function of the Society consistent with its purpose. They shall act in an advisory capacity to the Executive Council.

F. Awards Committee—shall consist of the Executive Council. The president may also appoint nonvoting advisory members as deemed necessary. The Committee may adopt, create, and offer awards for study, fellowship, contributions or developments in the field of Pediatric Neurosurgery. The cost of such awards may be defrayed from funds of the Society or
those which may be donated, entrusted, or bequeathed to the Society for such purposes.

G. Liaison Committee for Specialty Education—the composition of this Committee shall be:

1. The President who will preside as Chairman
2. The President-Elect
3. One senior member to be appointed by the Executive Council.
4. One member at large to be appointed by the Executive Council. It shall be the purpose of this Committee to pursue the highest educational standards possible for Pediatric Neurosurgeons. For these purposes it may function in liaison with any organization which is legitimately involved with undergraduate or graduate medical education in the United States or Canada. The overriding purpose of this committee is to foster and develop the highest standards of care for children with disorders of the nervous system.

H. Ethics Committee—shall consist of a Chairman and two additional members. Appointments will be made for two years and an appointee may serve consecutive terms. The Chairman shall be proposed by the Nominating Committee and elected by the membership at large. The other two members shall be suggested by the Executive Council and approved by the membership at the annual meeting. The committee shall address ethical and medico-legal issues relating to Pediatric Neurosurgery.

Section II:
The term for elected officers and Committee Chairmen shall begin the first day after the conclusion of the annual meeting at which the election occurred.

Section III:
In case of vacancies out of course occurring among officers or members of the Bylaws, Education, Credentials and Membership, or Nominating Committees, the Executive Council of the Society shall appoint substitutes to serve until the next annual meeting.

Section IV:
Any standing Committee shall meet at the call of its Chairman.

Section V:
In the conduct of Committee business, active committee member is entitled to one vote, either in person or by proxy.
Section VI:
Any standing committee which has been inactive or failed to produce a new work product for more than 3 years will either be dissolved or changed to an “ad hoc” committee status, at the bequest of the chairman and the executive committee.

ARTICLE VI—Fees

Section I:
There shall be an initiation fee to be paid upon acceptance to membership in the Society.

Section II:
The initiation fee and the annual dues shall be established by the Executive Council with the approval of two-thirds of the members present at the next regular business session.

ARTICLE VII—Meetings

Section I:
The Executive Council shall be responsible for arranging all general meetings of the Society.

Section II:
At least one annual meeting open to all members shall be held at a location and date to be determined by the Executive Council and announced at the preceding annual meeting.

Section III:
For each annual meeting, an annual meeting Chairman will be appointed by the Executive Council and announced at a preceding annual meeting. An Annual Meeting Chairman will be an ex-officio member of the Executive Council and will work with the Executive Council to determine the format and content of the annual meeting, with the approval of the Executive Council.

Section IV:
Each annual meeting will include the following sessions:

- The meeting of the Executive Council.
- The Scientific Session of the Society presided over by the annual meeting Chairman.
- The business meeting of the Society presided over by the President of the Society and attended by only the active and senior members of the Society.
Section V:
A quorum for Society business shall be constituted by the members present at the annual Society business meeting. Robert’s Rules of Order Newly Revised, shall govern the conduct of the meeting of the Society.

Section VI:
The order of business for the Executive Council and business meeting shall be as follows:

1. Call to order
2. Reading and approval of the minutes
3. Unfinished business
4. Report of the Officers and Committees
5. Report of Nominating Committee
6. Election of Officers
7. New business
8. Adjournment

Section VII:
Each active member of The Society may propose the name of one guest for invitation to each annual meeting. The proposed guest’s name must be submitted in writing to the Secretary of the Society at least six months prior to the meeting. The Executive Council shall determine which guests are invited and shall direct the Annual Meeting Chairman accordingly.

Section VIII:
The Executive Council may also invite official guests of the Society to participate in the scientific meeting.

ARTICLE VIII—Publications

Section I:
The Executive Council shall, when deemed appropriate, authorize publication of the proceedings and/or postgraduate courses.

Section II:
All contractual agreements relative to publications of The Society shall be between the Society and the publisher. The Executive Council shall represent the Society in all such matters, unless specifically delegated by them to the Editor.

Section III:
The Executive Council with the Publication Committee shall determine the vehicle for the publication of refereed articles that is the official voice of The American Society of Pediatric Neurosurgeons.
ARTICLE IX—Amendments

Section I:
Suggested amendments to these Bylaws must be proposed in writing and signed by at least five active members in good standing and must be submitted to the Secretary of the Society at least four months prior to the annual meeting at which the amendments are to be acted upon. If there is more than one proposed change, related changes would be identified by the submitting members and Executive Council, then considered and voted upon as grouped changes; unrelated changes will be considered and voted upon individually. The proposed amendments should be submitted in a format that specifies the “current” wording, highlights the “proposed” change, and includes a paragraph description of the “intent/reason/benefit” intended by the submitting group.

Section II:
An amendment or grouped amendments presented to the membership shall be voted upon by a minimum of 45% of the total membership eligible to vote, and adoption of the amendment or group of amendments requires affirmation by 2/3 of these votes. The vote shall take place in person at the annual meeting, or by mail or email on special recommendation by the Executive Council. In the latter case, the amendment shall be mailed or e-mailed to the eligible voting members of the Society by the Secretary, not less than two months prior to the vote deadline.

Section III:
Rules and regulations can be formulated by the membership and attached to the bylaws. Enactment of a Rule and Regulation requires a majority vote of members present at the duly constituted business meeting of the Society. Similarly, abolition of a Rule and Regulation requires a majority vote of members present at a duly constituted business meeting of the Society.
SAVE THE DATE

40th Annual Meeting

The American Society of Pediatric Neurosurgeons

January 22–27, 2017

Fairmont Kea Lani | Maui, Hawaii