SAVE THE DATE FOR 2006

2006 AANS/CNS Section on Pediatric Neurological Surgery Annual Meeting

NOVEMBER 28–DECEMBER 1, 2006
MARRIOTT DENVER CITY CENTER
DENVER, COLORADO
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Some drugs and medical devices demonstrated or described on the print publications of the AANS/CNS Section on Pediatric Neurological Surgery, and jointly sponsored by the American Association of Neurological Surgeons have FDA clearance for use for specific purposes or for use only in restricted research settings. The FDA has stated that it is the responsibility of the physician to determine the FDA status of each drug or device he or she wishes to use in compliance with the applicable law.

Neither the content (whether written or oral) of any course, seminar or other presentation in the program, nor the use of 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 AANS/CNS Section on Pediatric Neurological Surgery and jointly sponsored by the American Association of Neurological Surgeons, its Committees, Commissions, or Affiliates.
JAMES B. MCCLINTOCK, PHD

James McClintock was born in Ann Arbor, Michigan. He is an Endowed Professor of Polar and Marine Biology, as well as Interim Dean of the Graduate School at the University of Alabama in Birmingham. He is an invertebrate ecologist and marine chemical ecologist who received his MA and PhD at the University of South Florida.

His research interests are in the areas of reproductive and nutritional biology of marine and aquatic invertebrates, especially echinoderms, crustaceans and mollusks, physiological and chemical ecology, and hard and soft-bottom ecology.

Currently he is continuing with his studies of the chemical ecology of marine invertebrates, with an emphasis on those found in Antarctic ecosystems. These studies are focused on understanding the role of marine invertebrate secondary metabolites in mediating patterns of fouling, overgrowth and predation. He plans to continue with and expand upon all of the work described above, taking advantage of the rich diversity of freshwater, estuarine and marine environments of the southeastern United States.

Dr. McClintock is a member of several associations including the Society of Integrative and Comparative Biology, American Association for the Advancement of Science and International Society of Chemical Ecology. He has received numerous awards for his teaching and research. He is extensively published and aspects of his scientific research have been covered by the national media including National Geographic Magazine, NPR Radio, Discover Magazine, Chronicle of Higher Education, and Smithsonian Magazine.

RAIMONDI LECTURERS

1978 E. Bruce Hendrick
1979 Paul C. Bucy
1980 Floyd Gilles
1981 Panel Discussion
1982 Panel Discussion
1983 Derek Harwood-Nash
1984 Anthony E. Gallo, Jr.
1985 Frank Nabben
1986 William F. Meachem
1987 Dale Johnson
1988 Joseph J. Volpe
1989 Martin Eichelberger
1990 George R. Leopold
1991 Judith Pollman
1992 Olaf Flockmark
1993 Maurice Albin
1994 Blaise F.D. Bourgeois
1995 Robert H. Pudenz
1996 Samuel S. Flint
1997 M. Michael Cohen, Jr.
1998 Robert A. Zimmerman
1999 David B. Schurteif
2000 Steve Berman
2001 Alejandro Berenstein
2002 Volker K.H. Sonntag
2003 Jon Huntzaman
2004 J. Michael Bishop
2005 James B. McClintock

MATSON MEMORIAL LECTURERS

1987 John Shillito
1988 E. Bruce Hendrick
1989 Martin P. Sayers
1990 Roger Guillumin
1991 Robert L. McLaurin
1992 Joseph Murray
1993 Eben Alexander, Jr.
1994 Joseph Ransohoff
1995 John Holter
1996 None
1997 Maurice Choua
1998 Lisa Shut
1999 Gary C. Schoenwolf
2000 Postponed due to illness
2001 Donald H. Reigel
2002 David McLean
2003 Robin P. Humphreys
2004 A. Leland Albright
2005 Joan L. Veres

KENNETH SHULMAN AWARD RECIPIENTS

1984 ANN PIEL - A Laboratory Model of Shunt-Dependent Hydrocephalus
1985 ANN-CHRISTINE Coomi - The Shaken Baby Syndrome
1986 ROBERT E. BROZEL - Formation in Acute Ven-triculitis
1987 JULIA B. JAFFE - Shunt-Induced Reversal of Periventricular Pathology in Experimental Hydrocephalus
1988 SCOTT PALI - Rear Seat-Lap Belts. Are They Really "Safe" for Children?
1989 JAMES A. HESS - Tethered Cord as a Cause of Scoliosis in Children with a Myelomeningocele
1990 CHRISTOPHER D. HEYNER - Basilar Pons Attracts Its Cortical Innervation by Chemotactic Induction of Collateral Branch Formation
1991 K. CONRAD ADENDRO - Reorganization of the Cortical-Tectal Pathway Following Neonatal Cerebral Hemisphericectomy in Cats
1992 SANDY STONE - Effects of Biologically-Delivered Neurotrophins in Animal Models of Neural Degeneration
1993 MONICA C. WEHBY - Metabolic Demonstration of Retained CNF Function in the Rabbit Model of Infantile Hydrocephalus
1994 ELLEN SHINPEI - Experimental Acute Subdural Hemostoma in Infant Rats
1995 SRIED M. O'MADAIN - Correlation of Chromosome 1p Loss with Clinical Outcome in Patients with Primitive Neuroectodermal Tumors
1996 JEFF HARRIS - Platelet Derived Growth Factor Induces Differentiation of Neuroepithelial Stem Cells into Neurons
1997 MICHAEL DREWRE - Quantitative Analysis of the Toxicity of Human Amniotic Fluid to Rat Fetal Spinal Cord Cultures
1998 ADRIANA RANGER - Implantation of Medulloblastoma Cells into Collagen Type I Gels: Invasiveness, Enzymatic Characterization, and the Impact of Surgical Excision and Radiation
1999 KENNETH SHULMAN - The Surprisingly Sturdy Infant Brain: Why is it More Resistant to Focal Injury?
2000 KITAH B. BASSAN - Novel Findings in the Development of the Normal and Tethered Filum Terminale
2001 DAVID J. SANDBERG - Convection Enhanced Delivery into the Rat Brain Stem: A Potential Delivery for the Treatment of Diffuse Pontine Gliomas
2002 DAVID ADAMS - Mechanisms of Reclosure in 2 Surgical Models of Myelomeningocele Implications for Fetal Surgery
2003 JONAS E. MCKAY - Posture Independent Pressure Valve: A Practical Solution to Maintaining Stable Intracranial Pressure in Shunted Hydrocephalus
2004 JOSIAH E. MCKAY - The Permeable Proximal Catheter Project: A Novel Approach to Preventing Shunt Obstruction
2005 To Be Announced
AWARD RECIPIENTS

HYDROCEPHALUS ASSOCIATION AWARD RECIPIENTS

1989
ERIK ALTSCHULER Management of Persistent Ventriculomegaly Due to Altered
Brain Compliance

1990
S. H. MICHOWITZ High Energy Phosphate Metabolism in Neonatal Hydrocephalus

1991
DEBORAH GLASER Venous Sinus Occlusion and Ventriculomegaly in
Craniosynostosed Rabbits

1992
S. A. GREENSPAN The Reversal of High Energy Phosphate Metabolism Changes in
Experimental Hydrocephalus after CF Shunting

1993
CHARLES BONDRUK The Epidemiology of Cerebrospinal Fluid Shunting

1994
MONICA C. WENRY-GRAY The Rabbit Model for Infantile Hydrocephalus: Regional
Differences in the Cortical Metabolic Response to Hydrocephalus and Shunting

1995
RICHARD J. FOX Cerebrospinal Fluid Absorptive Site of the Pia-Vasculature Dura:
A Cavitative Study

1996
No Prize Awarded

1997
DAVID JOHNSON Reactive Astrocytosis in a New Model of Obstructive
Hydrocephalus

1998
No Prize Awarded

1999
KIMBERLY BINGHAM Hydrocephalus Induces the Proliferation of Cells in the
Subventricular Zone

2000
No Prize Awarded

2001
JANE TAYLOR Treatment of Hydrocephalus Using a Choroid Plexus Specific
Immunotoxin: An In Vitro Study

2002
JOSHUA MCKENZIE Quick Brain MRI vs. CT Scan for Evaluating Shunted Hydrocephalus

2002
JONATHAN MILLER Aberrant Neuronal Development in Hydrocephalus

2003
MANUEL REBOISNICK Serum and CSF C-Reactive Protein in Shunt Infection

2004
JET ROUGH Can the Skull Diode: Space Be Utilized for Absorption of
Cerebrospinal Fluid?

AND

JAY X. RYU-CAMPBELL Pediatric Posterior Fossa Tumors: Pre-operative Predictors
of Chronic Hydrocephalus.

PROGRAM SCHEDULE

TUESDAY, NOVEMBER 29

NOON – 5:00 PM
ONE-ON-ONE NOOSES SEMINAR
Colossal A

The nursing seminar will include presentations on the topics of Child
Malformations, Synaps, Quick Imaging
Techniques for the Pediatric Neurosurgery
Patient Shunts – Programmable vs. Non-
Programmable, Penetrating CNS injuries,
Moya-Moya Disease, Pediatric Headache: Sign
Or Symptom, and Craniosynostosis.

WELCOME AND OPENING REMARKS
National Ballroom C

5:00 – 5:15 PM
WELCOME AND OPENING REMARKS

6:00 – 8:00 PM
SCIENTIFIC SESSION I

CRANIOSYNOSTOSIS

National Ballroom C

Moderators: Jeffrey P. Blount, MD, FACE; Rick
Abbott, MD, FAAP

Learning Objectives: Upon completion of
this program, participants should be able to:
• Appraise new observations in the
diagnosis and treatment of craniosynostosis.
• Compare observations in animal models
of craniosynostosis with human
• Discuss advances in radiographic and
computed tomography in craniosynostosis.

5:15 – 8:12 PM
POSTER SESSION

1. "Craniosynostosis: A Technique for
Previously Uncorrected Sagittal
Craniosynostosis"
Matthew D. Smyth, MD; Christian Kaufman,
MD; Allen A. Kane, MD (St. Louis, MO)

8:12 – 8:24 AM
2. "A Comparison of Open and Minimally
Invasive Procedures for Craniosynostosis
Craniosynostosis"
Lauree Hollinger, E. Hollinger, BS; James E.
Baumgartner, MD; John F. Vescio, MD
(Houston, TX)

TUESDAY, NOVEMBER 30

7:00 – 8:00 AM
NATIONAL BREAKFAST
National Ballroom A/B

7:00 – 7:50 AM
WELCOME AND OPENING REMARKS

7:50 – 7:55 AM
WELCOME AND OPENING REMARKS

8:00 – 8:48 AM
SCIENTIFIC SESSION II

CRANIOSYNOSTOSIS

National Ballroom C

Moderators: Jeffrey P. Blount, MD, FACE; Rick
Abbott, MD, FAAP

Learning Objectives: Upon completion of
this program, participants should be able to:
• Appraise new proposed craniosynostosis
procedures, including new techniques and
minimally invasive procedures.
• Describe technical and methodological
challenges in evaluating different
procedures for craniosynostosis.

8:00 – 8:12 AM
1. "Clamshell" Craniosynostosis: A Technique for
Previously Uncorrected Sagittal
Craniosynostosis

Matthew D. Smyth, MD; Christian Kaufman,
MD; Allen A. Kane, MD (St. Louis, MO)

8:12 – 8:24 AM
2. "A Comparison of Open and Minimally
Invasive Procedures for Craniosynostosis
Craniosynostosis"
Lauree Hollinger, E. Hollinger, BS; James E.
Baumgartner, MD; John F. Vescio, MD
( Houston, TX)

NOVEMBER 29 – DECEMBER 2 | OMNI ORLANDO RESORT AT CHAMPIONSGATE

8:24 – 8:36 AM
3. Multiple Revision Spiral Osteotomy
and Additional Techniques for Cranial Vault
Remodeling and Expansion
Elizabet M. Trinidad, MD; Abraham W. Tullius,
MD; Lisa Zenki, RN, MSN; Andrew E. Auer,
MD, Patricia A. Mansco (San Antonio, TX)

8:36 – 9:48 AM
NETWORKING SESSION II

CONGENITAL ANOMALIES

National Ballroom C

Moderators: Jeffrey P. Blount, MD, FACE; Rick
Abbott, MD, FAAP

Learning Objectives: Upon completion of
this program, participants should be able to:
• Appraise new observations in the
pathophysiology of cranial malformations
and tethered spinal cord.
• Compare observations in animal models
of congenital CNS anomalies with the
human syndrome.
• Discuss advances in radiographic and
electrophysiological guidance in tethered
spinal cord surgery.

8:36 – 9:48 AM
4. Spinal Cutaneous Tethering Tracts in
Spina Bifida Occulta: Re-evaluation
Sharan Ropal, MD (Madison, WI); R. Shane
Tubbs, PhD (Birmingham, AL); Shantin
Salomat, MD, PhD (Madison, WI); W. Jerry
Oakes, MD (Birmingham, AL); Bernard J.
Islander, MD (Madison, WI)

8:48 – 9:00 AM
5. A Novel Spontaneous Sheep Mutant of
Spinal Neural Tube Defects
Timothy M. George, MD; Thomas J. Cummings,
MD; Lynette C. Stowell, DVM; Mary C. Spear,
PhD; James D. Reynolds, PhD (Durham, NC)
PROGRAM SCHEDULE

9:00 – 9:12 AM
6. The Symptomatic Post
Lipomyelomeningocele Resection Patient: Do Increases in the Lumbar Axial Ratio Indicate a Tethered Spinal Cord?* R. Shane Tubbs, PH, D.O.; William C. Rice, MD; John C. Welling, III, MD; Jeffrey P. Blount, MD; W. Jerry Oakes, MD (Birmingham, AL)

9:12 – 9:24 AM
7. Electrophysiologically-guided Untethering of Secondary Tethered Spinal Cords Following Myelomeningocele Repair Nedra Pousson, MD, PhD; John A. Jaine, Jr., MD; Tracy L. Overwold, BS; W. J. Ellis, MD; Lawrence A. Phillips, MD; John A. Jane, Sr., MD; PH, D.O. (Charlotteville, VA)

9:24 – 9:36 AM
8. Posterior Fossa Volume in the Myelomeningocele Population: a Novel Observation Rayne K. Thomas, M.D.; Oas D. Kankari; Dene S. Entwistle; Herbert E. Fuchs; Timothy M. George (Durham, NC)

9:36 – 9:48 AM
9. Enhancement of Re-closure Capacity by the Intravascular Injection of Human Embryonic Stem Cells in Surgically Induced Spinal Ossification Neural Tube Defects in Chick Embryos Vu-Fu Chang, MD; Ao-Fun Lin, MS; S. Jai-Park, MD; Seung-Ki Kim, MD; Jinho Lim, MD; Byung-Kyu Cho, MD; Seung-Ki Kim, MD (Seoul, Republic of Korea)

9:48 AM – 10:00 AM
EXHIBIT & POSTER VIEWING IN EXHIBIT HALL
National Ballroom A-B

9:50 AM – 10:30 AM
BEVERAGE BREAK IN EXHIBIT HALL
National Ballroom A-B

10:10 AM – 11:00 AM
TUMORS: NATIONAL BALLROOM A/B
Moderators: Mark M. Souweidane, MD, Jeffrey H. Wu, MD
Learning Objectives: Upon completion of this program, participants should be able to:
- Describe novel proposed methods of delivery of chemotherapeutic agents to CNS tumors.
- Review peritumoral histological findings of pediatric brain tumors to long-term outcome.
- Formulate the role of preoperative chemotherapy in selected brain tumors.

10:10 AM – 11:00 AM
9. Neural Stem Cells Target and Deliver Prodrug Gene to Experimental Intracranial Medulloblastoma Seung-Ki Kim, MD (Boston, MA); Seung U. Kim, MD (Seoul, Republic of Korea); Karen S. A. Boody, MD (Durham, CA); Kay-Chang Wang; Byung-Kyu Cho (Seoul, Republic of Korea); Peter M. Black, MD; Ronan S. Corrall, PhD (Boston, MA)

10:40 AM – 11:40 AM
10. Digital Karyotyping Identifies a Novel Retinoblastoma Oncogene Dori C. Adamski, MD; MD, PhD; Timothy M. Geising; MD (Durham, NC)

11:00 AM – 11:45 AM
11. Effects of Hydrocephalus on IQ in Children with Infratentorial Epilepsy Before and After Conformal Radiation Therapy Robert A. Sanford, MD (Memphis, TN); Thomas C. Merchant, DO, PhD; Frederick A. Boop, MD; Nadaa Khaleel, MD (Memphis, TN)

11:45 AM – 12:30 PM
SCIENTIFIC SESSION IV
TUMORS: NATIONAL BALLROOM C
Moderators: David W. Pinus, MD, PhD; Frederick A. Boop, MD, FACS
Learning Objectives: Upon completion of this program, participants should be able to:
- Estimate the value of intraoperative delivery of monoclonal antibodies into tumors with plasma release of molecular constructs.
- Discuss the major obstacles of intracranial resection in long-term follow-up.

1:00 – 1:30 PM
17. Intratumoral Interstitial Delivery of Anti-glioma Monoclonal Antibody BHP Neal Kutcher, MD; Mark A. Edgar, MD; Nor- long Y. Cheung, MD, PhD; Philip H. Guiton, MD; Mark M. Souweidane, MD (New York, NY)

1:30 – 2:12 PM
18. Noninvasive Diagnosis of Pediatric Placodal Acrotrichomas by Advanced Magnetic Resonance Spectroscopy Mark D. Kniger, MD; Ashok Panyigohry, MD; Gordon McComb, MD; Alan M. Nelson, MD; Ignacio González-Gómez, MD; Floyd Gilles, MD; Stefan Blume, MD (Los Angeles, CA)

2:12 – 3:00 PM
20. Extracranial Functional Mapping via Staged Resection of Supratentorial Tumors in Children Robert J. Bello, MD; Chad Carlson, MD; Catherine Schieren, MD; Jeffrey Wissoff, MD; Vonni Dvinskis, MD; Howard Weiner (New York, NY)

2:48 – 3:30 PM
21. Efficacy of Local Delivery 3-hydroxyproprionate in the Treatment of a Brain Tumor George J. Lulich, MD (Baltimore, MD); Cyma Wang, MD; Margaret Penno, MD; Warren fkk, RV; Young K. Pho

3:00 – 3:30 PM
23. Development of a Long-lasting Lacazyme Catheter Impregnated with Rifampicin. James P. Mccallister, MD; Xuan Luong, MD; Anfeng Wang, MD; Haway Tang, BS; Ting Cao, BS; Steven D. Salley, PhD; Kelley Brabant, BS; Carolyn Black, Jr, UMDD; Kym Sim Ng, PhD (Detroit, MI)

3:30 – 4:12 PM
26. Diagnosis and Management of Growing Skull Fractures: The Memphis Experience John S. Wineconte, MD; Frederick A. Boop, MD; Nina L. Gross, MD; Michael S. McLaughlin, MD; Stephanie L. Ennaus, MD; Robert A. Sanford, MD; The University of Tennessee-Memphis (Memphis, TN)

4:12 – 4:30 PM
30. Children with CNS Tumors Discovered Incidentally After Trauma Gwynyth Hughes, BA; Alan R. Cohen, MD; Shenandoah Robinson, MD (Cleveland, OH)

4:30 – 5:12 PM
31. Use of Minimally Invasive Techniques for Tethered Cord Release: Technical Note Jonathan E. Martin, MD; Daniel J. Donovick, MD (Baltimore, MD)

4:12 – 5:12 PM
32. Essential Factors of Tethered Cord Syndrome Shelok Yamada, MD, PhD; Uma Linda, CA; Daniel J. Wren, MD (Portland, CA); David B. Kneuer, MD; (Madison, WI); Jared Sidleski, MD, PhD (Colton, CA)

4:36 – 5:30 PM
36. Poster Presentation A National Ballroom A-B
2:45 – 3:15 PM
National Ballroom A-B

3:15 – 4:51 PM
SCIENTIFIC SESSION VII

MISCELLANEOUS

National Ballroom C
Moderator: Bernarr J. Isler, MD, MD, John Rhyne, MD

Learning Objectives: Upon completion of this program, participants should be able to:

1. Discuss challenges of bringing new technologies such as coated shunts and scanning laser ophthalmoscopy to clinical use.
2. Describe recent advances in surgery for stroke and ischemia in arterial and venous disease.

3:15 – 3:37 PM

54. Apoptosis Seems to be the Major Process While Surface and Neuronal Ectodermal Layers Deter During Neuropathology
Helmets Satsu, MD, PhD (Osaka, Japan)

3:37 – 3:59 PM

55. Cerebral Revascularization for the Medically Intractable Patient with Progressive Cerebral Artery Stenosis Caused by Sickle Cell Disease
Roger B. Jones, MD, Lynn Garsh, RN, Beatrice Gac, MD, Beatrice Fiske, MD, William Boydston, MD, Andrew Rainier, MD, Kevin Stewart, MD, Thomas Bums, PhD (Atlanta, GA)

3:59 – 4:31 PM

56. Incidence of Venous Infarction after Sacrificing Mid Sagittal Sinus Bridging Veins
Van Tran, MD, JD, Gordon McCombe, RN, FACS, Sean McElhatton, MD, Mark Kriger, MD (Los Angeles, CA)

4:31 – 4:51 PM

57. Intermodal Rejection Improvement Hind Limb Function Until Onset of Paralysis in an Experimental Intramuscular Spinal Cord Tumor
Justi M. Calcin, BA, Al Adbel, BS, Gottfredo Padilla, MD, Betty Tyler, BA, Frederico Legnam, MD, William Penner, Andrey Vollno, BA, Henry Bear, MD, George Jaffe, MD (Baltimore, MD)

4:03 – 4:41 PM

58. Astrocyte and Choroid Plexus Growth on Silicone Coated Materials and Self-Assembled Monolayers
James P. McAlester, PhD, Krut Patel, MS, William E. Greer, MD, Haiqiang Tang, BS (Detroit, MI) Johning Xang, Richard F. Kees, PhD (Arbor Arb, MD), Kelley E. Blabat, BS, Carolynn A. Black, KY, S. Ng, PhD (Detroit, MI)

4:41 – 4:57 PM

59. The Vaso Grades Pump is Essential to Regeneration of the Adult CNS
Bernarr J. Isler, MD, Elias Rizk, MD, Dondan Sun, PhD, Rulio Vermaagani, PhD, Nyhaya Hanak, MD (Madison, WI)

4:47 – 4:59 PM

60. Use of the Far Lateral Transcondylar Approach in Children
David W. Persin, MD, PhD, Stephen B. Lewis, PhD, FAACS (Gaithersburg, FL)

4:39 – 4:51 PM

61. Laser Image Mapping of Papillodema and Intracranial Pressure
Jeffrey A. Cutts, MD, (Network, NJ), Dennis Roberts, BA, BS, PhD, Gordon Thomas, BA, BS, PhD, Sandra Kosinski, BA, BS, PhD, Warren Han, MD, MS (Los Angeles, CA)

4:51 – 5:00 PM

ANNUAL BUSINESS MEETING

National Ballroom C

OPEN EVENING

5:00 – 5:15 PM

FRIDAY, DECEMBER 2

7:00 – 8:00 AM
PUBLISHER’S BRIEFING

National Ballroom A-B Foyer

7:00 – 10:00 AM
REGISTRATION

National Ballroom C Foyer

8:00 – 9:30 AM
SPECIAL SESSION: SYMPOSIUM

National Ballroom C

Benjamin Barnard, MD, Joseph H. Piat, Jr., MD, David Douglas Cochrane, MD

9:00 – 11:00 AM
EXHIBIT & POSTER VIEWING

IN EXHIBIT HALL

National Ballroom A-B

9:30 – 9:54 AM
SCIENTIFIC SESSION IX

Hydrocephalus

National Ballroom C

Moderator: David Douglas Cochrane, MD, John C. Wollyns, MD

9:54 – 10:42 AM

62. Intrathecal Assessment of Third Ventriculostomy Success
Jeffrey P. Brownfield, MD, PhD, Mark M. Stowe, MD (New York, NY)

9:42 – 9:54 AM

63. Has Regulation Improved the CSF Shunt?
Stephen J. House, MD (Minneapolis, MN), Jeffrey P. Blount, MD (Birmingham, AL)

10:30 – 12:46 PM
SCIENTIFIC SESSION X

Hydrocephalus

National Ballroom C

Moderator: Joseph H. Piat, Jr., MD, David Douglas Cochrane, MD, John C. Wollyns, MD

10:42 – 10:54 AM

64. Utility of Antibiotic Impregnated Extraventricular Drains
R. Shane Tubbs, PhD, James Costa, MD, R. Scott Hammad, MD, Elizabeth Blackburn, RN, John C. Wollyns, MD, Jeffrey P. Blount, MD, W. Jerry Oaks, MD (Birmingham, AL)

11:42 – 11:54 AM

70. Pathophysiology of Communicating Hydrocephalus in Clinically Relevant Experimental Models
James P. McAlester, PhD, Jie Li, MD, Janet M. Miller, PhD, Parthasaranthy S. Sarnath, BS (Detroit, MI), Michael R. Stogni, MD, Mark Wiggah, PhD (Stony Brook, NY), Curt Stewart, MBA (Carefree, AZ), E. Mark Haddad, PhD (Detroit, MI), Marion E. Walker, MD (Salt Lake City, UT)

11:58 AM – 12:10 PM

71. Effects of Silicone Surface Coatings on Staphylococcus Epidermidis Adhesion and Colonization
James P. McAlester, PhD, Haining Tang, BS, Xuejun Liang, PhD, Ting Cao, BS, Steven G. Safley, K.Y. Simon Ng, PhD (Detroit, MI)

12:10 – 12:22 PM

72. Inhibitory Effects of Minocycline on Gliosis in the Hydrocephalic H-T Rat
Janet M. Miller, PhD, Alexander G. Shams, Steven D. Ham, DOI, James P. McAlester, PhD (Detroit, MI)

12:22 – 12:34 PM

73. Endoscopic Third Ventriculostomy in the Management of Patients with Diffuse Pontine Gliomas
Liliana C. Guerra, MD, FRCSI(C), Paul Firms, MD (Boston, MA)

12:34 – 12:46 PM

74. Gray Zone Hydrocephalus and “The 30 Centimeter Syndrome”
Mehrdad B. Ali, MD, MD (Giza, Egypt)

PRESENTATION OF THE HYDROCEPHALUS ASSOCIATION AWARD

12:46 – 1:00 PM

CLOSING REMARKS

W. Jerry Oaks, MD
The American Association of Neurological Surgeons and Congress of Neurological Surgeons Section on Pediatric Neurological Surgery thank the following companies for their educational grants in support of the Annual Meeting:

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Program Book
General Session

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Opening Reception
Speaker Sponsor

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Speakers and paper presenters/authors who have disclosed a relationship with commercial companies, whose products may have a relevance to their presentation, are listed below:

- **Stephen J. Harris, MD**
  - Grants/Research Support
  - Medtronic PS Medical

- **James P. McAllister, PhD**
  - Grants/Research Support
  - Brain Child Foundation
  - Grants/Research Support
  - STARS Support Group

- **Elise Rock, MD**
  - Funding from Howard Hughes and the American College of Surgeons
1. 'Clamshell' Craniorrhaphy: a Technique for Previously Uncorrected Sagittal Craniosynostosis

Matthew D. Smyth, MD, Christian Kaufman, MD, Alex A. Klein, MD (Zurich, CH)

Introduction: While most sagittal craniosynostosis is recognized and treated in infancy, some children are not brought to the attention of craniofacial centers until early childhood. We describe our operative technique for calvarial reconstruction in older children with previously untreated sagittal craniosynostosis.

Methods: We describe eight patients treated with a novel single-stage calvarial reconstruction using the supraciliary approach. The procedure consists of a coronal incision, bifrontal craniotomy without orbital osteotomy and multiple interlocking mini-patellar-occipital osteotomies and recontouring. Fixation is achieved with a bioabsorbable plating system. Pre, intra-, and post-operative photographs and 3D CT scans will be presented for review.

Results: Between November 2003 and April 2005, we treated seven patients with uncorrected sagittal craniosynostosis and one with papyrusry in using this technique. All were boys with ages ranging from 1 to 5 years, mean 4.2 years. Average operating time was 5.5 hours (3.6 to 8.1), with an average blood loss of 425 cc (200 to 800 cc). As a percentage of estimated circulating blood volume, mean operative blood loss was 33.6% (17% to 56%). Average hospital stay was 49 days. Cranial index improved from a mean of 65.6 to 71.3%. No acute or delayed complications have been recognized. Follow-up at an average of 6 (4 to 15) months confirms excellent early patient and family satisfaction.

Conclusions: An approach of aggressive calvarial reconstruction with multiple interlocking osteotomies across the midline achieves excellent improvements in bitemporal narrowing. Combined with a bifrontal reconstruction, early outcomes are excellent, with acceptable intraoperative blood loss and no significant complications.

2. A Comparison of Open and Minimally Invasive Procedures for Craniosynostosis

Laura Hollinger E. Hollinger, BS, James E. Baumeister, MD, John F. Toogood, MD (Houston, TX)

Introduction: The authors have developed and performed a new microsurgical approach to craniosynostosis designed to minimize the risks of traditional open repair. Results from the microscopic approach were compared to those of the open approach for sagittal, metopic and coronal synostoses.

Methods: From January 2001 to May 2005, the authors performed 35 microscopic and 55 open procedures for sagittal, metopic, and lambda synostoses. The authors' approach places a small incision over the prematurely fused sutures, and uses the operative microscope, a 5 mm diamond drill performs a 5 mm synostectomy. Bilateral patellar-occipital craniosynostomies are also employed for sagittal synostosis.

Postoperatively, all patients require mold therapy. This retrospective chart review compared operative times, hospital stays, blood transfusion rates, and pre- and post-operative head measurements for both the open and microscopic approaches.

Results: Patients treated microsurgically averaged 34 months of age. The impact of surgery on patients was greatly minimized with the microscopic approach, which cut surgical time by 75 minutes, hospital stays by more than one day, and blood loss by 500cc. Anthropometric head measurements for patients with sagittal synostoses demonstrate correction of cephalic indices to normal, shifting from 68 pre-operatively to 79 post-operatively. Patients with coronal synostoses show improvement in cephalic indices from 91 pre-operatively to 86 post-operatively.

Conclusions: The microscopic approach offers a safe and beneficial alternative to the traditional synostectomy procedure with outstanding aesthetic results.

3. Multiple Revolution Spiral Osteotomy and Additional Techniques for Cranial Vault Remodeling and Expansion

Elizabeth M. Trinkad, MD, Alemw W. Tullu, MD, Lisa Zenda, RN, MSN, Andrew E. Alber, MD, Patricia A. Marusco (San Antonio, TX)

Introduction: The authors present their experience in performing three different cranial vault remodeling and expansion methods. A total of 70 patients underwent cranial vault remodeling and expansion utilizing three different surgical techniques. In addition, to provide immediate correction of their deformities these techniques also increase intracranial volume which allows for immediate relief of existing intracranial hypertension and reduces the possibility of future development. Multiple revolution spiral osteotomy was utilized in 55 patients to correct cranial deformities and relieve intracranial hypertension, including 5 cases of "flat-vertex" syndrome. We present the outcome, benefits and complications in this series of patients. The multi-concircular osteotomy technique was used to correct specific deformities in 12 patients. We describe this technique as well as its advantages and early results. We also introduce another promising new technique, the Omega procedure. We provide a description of this technique which has now been utilized in three patients (5-6 months of age) to treat scaphocephaly secondary to premature sagittal suture synostosis while providing cranial expansion for this younger age group.

Conclusions: The availability of three different cranial vault remodeling and expansion techniques, multiple revolution spiral osteotomy, multi-concircular osteotomies and Omega procedure promises great versatility for all age groups in the ability to correct various cranial deformities while also producing an increase in intracranial volume.
4. Spinal Cutaneous Tethering Tracts in Spina Bifida Occulta Reevaluation

Kenneth Shulman Award Candidate
Shalak Rajagopala, MD, MPH (McGovern), WM; K. Shane Tubbs, PhD (Birmingham, AL); Shashik Salamot, MD, PhD (Madison, WI); W. Jerry Oakes, MD (Birmingham, AL); Nermaj N. Isakandar, MD (Madison, WI)

Introduction: Since the seminal publication “Spina Bifida Occulta” by James and Lassman in the 1970s, various tethering tracts or bands have been recognized as part of the spectrum of occult spinal dysraphic lesions. These tracts were named according to their assumed histological composition: meningocele, dermal sinus tracts, and paraspinal or dermal bands. Such a classification system has not been systematically confirmed or refuted in any subsequent study.

Methods: In this study, we examined the histological composition of tracts selected from patients with spina bifida occulta at two academic institutions. We have then classified these based on their clinical, histological, and anatomical characteristics.

Results: 21580 patients were identified (22 Univ. of Wisconsin; 9 Univ. of Alabama) with tethering tracts arising in the spinal cord. 60% had cutaneous anomalies present in these tracts, but not in the skin (6) or cutaneous (6). Some had falciform or bow. The majority of these tracts that ended either in a cutaneous veins or veins and/or veins that arose in an intradural diaphragm had epidural fat. The presence of mesonephric elements or peritoneal components in tethering tracts was rare, and such tracts were not associated with cutaneous anomalies. Split cord malformations tended to be associated with spinal tracts that inserted in the dura rather than the skin. CNS and adipose tissue was present in 20% and 35% of tracts, respectively.

Conclusions: We propose a new classification system of spinal cutaneous tethering tracts in spina bifida occulta based on clinical, histological, and anatomical criteria.

5. A New Spontaneous Sheep Mutant of Spinal Neural Tube Defects

Timothy M. George, MD, Thomas J. Cummings, MD, Iohannes G. Gialon, DVM, Mary C. Spier, PhD, James D. Reynolds, PhD (Durham, NC)

Introduction: We describe a novel large animal model that closely mimics the pathology and associated anomalies seen in human spinal neural tube defects.

Methods: A herd of sheep from the Bapsh Sheep Farm in Ohio was studied over a two-year period.

Results: From 18 ewes, a total of 42 lambs were born with 11 lambs having spina bifida. Of these lambs, 15 lambs with spina bifida were from 9 different ewes. There were 6 rams and 5 ewes. Six of the affected lambs were products of twin gestation and one was a quadruplet pregnancy, and the remaining 4 were single fetuses. None of the lambs had spinal bifida. None of the mother ewes with a spina bifida lamb had another pregnancy with a spina bifida fetus. The ewe flock was made up of 4 crossbred strains and was originated from commercial sources. The sheep were investigated all of the ewes. Clinical studies revealed only the presence of the Cache Valley Virus in some of the lambs.

Conclusions: Necropsy revealed that all of the sheep had open lumbar defects associated with varying degrees of hindbrain herniation (Chari malformation), hydrocephalus, and one had a cranial meningocele. All had abnormally short tails.

Histology and immunohistochemical analysis of the brain cord was performed.

Conclusions: The sheep model described here has the potential to be the closest model of human spina bifida to date. It will allow for the study of prevention and novel treatment strategies of children afflicted with HDH.

6. The Symptomatic Post-Lumbar Puncture Myelopathy Associated with the Intrathecal Administration of Erythropoietin

R. Shane Tubbs, PhD, P.A.C, William C. Rice, MD, John C. Wolfson, Jr, M.D., Jeffrey G. Blount, MD; W. Jerry Oakes, MD (Birmingham, AL)

Introduction: The angulation of the spine is easily measured. We have reported symptomatic myelomeningocele patients who have been found to have high levels in their lumbar sacral angle (LSA) corresponding to the onset of symptoms from a tethered spinal cord. This study presents a 5-year review of patients with occult spinal dysraphism.

Methods: Retrospective analysis of 50 consecutive symptomatic lumbar punctures was performed. Thirty age-matched controls were also analyzed.

Results: Indications for a lumbar puncture included headache, no headaches, and normal headache. The average age of the patients was 45 (10-91) and of the controls was 55 (10-98). All patients had lumbar punctures that were found to have corresponding LSA measurements of greater than 50 degrees with seven of these patients showing signs of a tethered spinal cord (e.g. decreased lower extremity function, bladder incontinence). Lumbar punctures were statistically (p<0.05) greater in our symptomatic patient population compared to controls.

Conclusions: Signs and symptoms indicative of a tethered spinal cord correspond to an increase in the LSA. This radiological finding may prove useful to the clinician in the diagnosis of the tethered spinal cord as an adjunct in verifying symptomatology in patients with a lumbar puncture.

7. Electrophysiologically-guided Lesioning of Secondary Tethered Spinal Cord Following Myelomeningocele Repair

Kenneth Shulman Award Candidate
Nader Poussaint, MD, PhD, John A. Jone, Jr, MD, Tracey L. Owersmy, BS, W. J. Elias, MD, Louisanna A. Phiala, MD, John Jone, Jr, MD, PhD, P.A.C (Charlestowne, VA)

Introduction: It has been observed that the posterior fossa in children with Chiari malformation is flattened; reduced in size and has a low posterior temporal in position. The myelomeningocele (MM) population, some have hypothesized that this malformation occurs as a result of constant leakage of CSF by way of the MM defect during gestation thus preventing distension of the posterior fossa. This consequently leads to a small posterior fossa with upward herniation into the supratentorial compartment and downward into the spinal canal. Our present study measures the posterior fossa volume in infants with a MM.

Methods: Forty-two patients diagnosed as having a lumbar sacral MM born between 2000-2005 were selected for review. All patients were noted to have a Chiari malformation. Twenty-two of the patients had a ventriculoperitoneal shunt placed. Ventriculoperitoneal shunt placed. CSF was imaged using the MRI examination method employed in the analysis of all patients prior to shunting using the Caudal vein method to define posterior fossa volumes. Comparison was performed using age-matched controls without a MM but with hydrocephalus.

Results: Mean posterior fossa volumes of myelomeningocele patients with a Chiari II malformation were greater than the mean volume of patients with hydrocephalus but not more than in Chiari II.

Conclusions: With regards to the above findings in myelomeningocele patients with a Chiari II malformation, we have found that the average posterior fossa volume is larger. This new information may change our understanding and support an alternative explanation regarding the pathophysiology of Chiari II malformation in the MM population.

8. Posterior Fossa Volume in the Myelomeningocele Population: A New Observation

Kenneth Shulman Award Candidate
Kewy K. Thomas, MD, César I. Paneda, DOE, S. Entelienic, Herbert E. Fuchi, Timothy M. George (Durham, NC)

Introduction: To evaluate the role of embryonic stem cells as a method of prenatal management for open neural tube defects (ONTDs). Human embryonic stem (hES) cells were injected into the amniotic cavities of chick embryos with surgically induced spinal ONTD and the presence of enhancement of repair capacity was tested.

Methods: The neural tubes of Hamburger and Hamilton (HH) stage 18 or 19 chick embryos were longitudinally incised open. In the experiment of hES cell injection on postoperative day (POD, operation = neural tube incision) 0, the embryos were divided into a control group (no injection), a vehicle group, and a hES cell group (injection of 20,000 hES cells immediately after neural tube incision). In the experiment of hES cell injection on POD 1 day after neural tube incision. The length of ONTDs was measured and the shape of neural tubes and the presence of hES cells in the neural tissue were investigated.

Conclusions: In both of the experiments on PODs 0 and 1, ONTDs were significantly smaller in the hES cell group than in the other groups 3.5 and 7 days after injection. The hES cells were covering ONTDs in the process of re-closure, but were not found in the neural tissue at already-re-closed area, suggesting indirect effects rather than cell replacement on the neural tissue.
11. Digital Karyotyping Identifies a Novel Retinoblastoma Oncogene

Kenneth Shulman Award Candidate

D. Cory Adamson, MD, PhD; Timothy M. George, MD (Durham, NC)

Introduction: Retinoblastoma is the most common malignant intracranial neoplasm of childhood and can be associated with an irreversibly pinesal neoplasms. Retinoblastoma extension into the optic nerve or coexistence with a pineal neoplasm is associated with a particularly poor outcome. Despite effective exfoliation by the surgical and radiation treatment pathways for tumor growth can lead to therapeutic targets.

Methods: Digital karyotyping, a new state-of-the-art technique for performing genome-wide screens at high resolution was performed on PNET tumors to identify genetic alterations. FISH and real-time quantitative PCR were used to confirm potential oncogene amplifications and immunohistochemistry was used to assess protein expression. RT-PCR and gene expression were evaluated by proliferation, cell cycle, and cell death assays to determine oncogenic potential.

Digital karyotyping revealed amplification of the homeobox gene OTX2 in primary retinoblastoma tumors and cell lines. OTX2 amplification was confirmed by FISH and Q-PCR, and immunohistochemistry identified OTX2 protein expression. Knockdown of OTX2 expression by shRNA inhibited oncogenic cell proliferation and colony formation in vitro, whereas, OTX2 overexpression induced a tumor phenotype. Importantly, pharmacologic doses of all-trans retinoic acid repressed OTX2 expression and induced apoptosis in retinoblastoma cell lines.

Conclusions: Through these genome and expression analyses, we identified OTX2 as a novel oncogene in retinoblastoma that could be genetically and pharmacologically targeted. This investigation opens the door for additional novel signaling pathways in this malignant tumor and provides preclinical evidence for a potential clinical therapy.

12. Effects of Hydrocephalus on IQ in Children with Intracranial Epidermoidoma Before and After Conventional Radiation Therapy

Robert A. Sanford, MD; Thomas C. Merchant, DO, PhD; Frederick A. Boss, MD; Naina Gross, MD (Memorial, TN)

Introduction: Our prospective study measured the influence of hydrocephalus on IQ in children with intracranial epidermoidoma before and after radiation therapy.

Methods: Methods: 25 hydrocephalic patients were enrolled at the time of diagnosis and at least 3 months intervals following radiation therapy. There were 19 children, median age of 4.1 years, enrolled in the study. 50% (5/10) of whom had hydrocephalus and 25% (3/12) required placement of a cerebrospinal fluid shunt. Before and after treatment IQ was measured using age-appropriate testing. Standard regression techniques were used to correlate multiple clinicopathological measures and IQ using a generalized linear model. Children with higher ELO (ELO, 0.01), at the time of diagnosis were more likely to have lower IQ scores before radiation therapy. Patients with higher ELO (ELO > 0.04) at the time of diagnosis were more likely to have decreased IQ scores after radiation therapy. The rate of change in IQ after radiation therapy was positively correlated with CM1 intercept (0.001) and negatively correlated with rate of (P < 0.001).

Conclusions: Change in IQ score before and after radiation therapy are significantly influenced by the extent and treatment of hydrocephalus and the age of diagnosis.

13. The Role of Diffusion-weighted MR Imaging in Pediatric Brain Tumors

Kenneth Shulman Award Candidate

Peter K. Kim, MD; James Liu, MD; Glory Hedlund, Douglas Bridger, MD, Monica Walker, MD; John Winkler, MD (Salt Lake City, UT)

Introduction: Conventional MR imaging helps to characterize the location and extent of brain tumors but often provides limited information regarding their grades and types. Recent studies suggested that diffusion-weighted MR imaging (DWI) may enhance the radiographic characterization of brain tumors. The purpose of our study is to review the DWI properties of pediatric brain tumors at our institution and examine its relationship with tumor grade.

Methods: Since the institution of DWI in 2001, we identified 31 children with histologically verified brain tumors and preoperative DWI. On the basis of histology, tumors were separated into two groups: “low grade” and “high grade.” The signal characteristics of each lesion on DWI and ADC maps were compared to the similarity and variation in the signal intensity, the sensitivity, specificity, positive predictive value, and negative predictive value of DWI as a test to discriminate between high grade and low grade tumors were calculated.

Results: Signal characteristics on DWI and ADC maps correlated well with tumor grades. High grade lesions appeared to be hyperintense with diffusion restriction on DWI and hypointense on ADC maps. Sensitivity, specificity, positive predictive value, and negative predictive value were 78%, 100%, 100%, and 93%, respectively. All primitive neuroectodermal tumors (PNETs) showed evidence of diffusion restriction whereas none of the epidermoids did.

Conclusion: The signal characteristics on DWI and ADC maps may predict tumor grade in pediatric brain tumors. This routine use could be helpful to pediatric neurosurgeons preoperatively in differentiating fourth ventricular tumors, planning treatment, and predicting prognosis.

14. Neurocognitive Outcome in Pediatric Craniopharyngiomas: the Influence of Surgical Resection and Conventional Radiation Therapy

Eric N. Kielha, MD; Frederick A. Boss, MD; Robert A. Sanford, MD; Larry J. Kain, MD; Raymond K. McMillan, PhD; Cheng Long Li, MD; Keping Kong, PhD; Kort, A.C.; Thomas E. Merchant, DO, PhD (Memphis, TN)

Introduction: Radical surgery for craniopharyngiomas can be achieved without adversely impacting cognition in patients with small tumors that are completely resected. For more extensive tumors with hypothalamic invasion, the authors have advocated limited surgery and conformal radiotherapy (CRT). We conducted a prospective trial of radical surgery for craniopharyngiomas to determine how irradiated volume, surgical and clinical variables impacted cognitive function.

Methods: Between July 1997 and January 2003, 28 pediatric patients (median age, 73.41 years) with craniopharyngiomas received CRT with a 1 cm margin. They were classified into three groups based on the extent of resection and post-operative neuroimaging. Neuropsychometric scores were performed prior to CRT, at six months and annually thereafter. Statistical analyses were performed to determine the effect of radiation dosimetry as well as clinical and surgical variables on IQ.

Results: The median follow-up was 36.6 months [range 24.4-45.0 months]. The estimated 5-year progression-free survival was 90.3%-73%. Three patients experienced local disease progression. Cognition was adversely affected by allergy, acute presentation, moderate or extensive surgery, multiple surgeries, diabetes insipidus, hydrocephalus, shunt placement and radiation, and cyst aspirations. The percent volume of total brain, supratentorial or left temporal lobe receiving dose in excess of 45 Gy continued to impact longitudinal IQ. This series, surgical intervention maintaining hypothalamic integrity reduces surgical morbidity and mortality and preserves cognition.

15. Local Delivery of MfN in a Brainstem Tumor Model Using a Conjugated Guide Screw

George J. Jollis, MD; Andrei Volkov, BA; Margaret Perino, PhD; Cyrus Wong; BE; Ru Chin Huang, PhD (Baltimore, MD)

Introduction: Previous research has demonstrated that tetra-o-methyl nonylnonadecylamine (MfN) exhibits tumoridal activity by inhibiting CDK kinase activity, thus inducing G2 arrest in mammalian cells. This study examined the efficacy of MfN in treating the progression of P38 tumor cells in vitro and in the rat brains.

Methods: A previously established rat brainstem tumor model was used, in which P38 glioma cells were injected into the ventrobasal thalamus of the rat, and the resulting tumors were assessed for neurodegenerative deficits in the animals throughout the progression of the tumor. Rodent brains for each dose were harvested for histological analysis at defined intervals. An additional study determined the in vitro efficacy of MfN.

Results: Rotated performance and clinical observation of animals displayed apparent 20 days post-tumor injection. A single dose of MfN (30 mg/kg) produced a 90% decrease in post-tumor injection. In vitro a single treatment with 1.5 MfN decreased cell viability by as much as 90% in 24 hours.

Conclusions: A single dose of MfN significantly decreases cell viability [30%] and prolongs the onset of paralysis 1 day without toxicity. Further studies may be done to determine whether multiple doses or extended release of MfN may prevent paralysis in this model altogether, providing a possible treatment for pediatric brain tumors.
16. Intramuscular Intrathecal Delivery of Antimyogenic Monoclonal Antibody in Brain Tumors

Kenneth Shulman Award Candidate
Niall (Luke) MD, Mark A. Edger, MD, Hai K. Chiang MD, MD, PhD, Philip H. Gurt TD, MD, Mark M. W. S. M. Brown, MD, PhD, C. L. C. H. Shear, MD, PhD

Introduction: Recombinant human nerve growth factor (rhNGF), a growth factor that has been shown to have neurotrophic effects, can be delivered to the central nervous system (CNS) by intrathecal or intramuscular routes. It has been used to treat various neurological disorders, including spinal cord injuries and amyotrophic lateral sclerosis (ALS). However, the safety and efficacy of this approach remain uncertain. The purpose of this study was to evaluate the safety and efficacy of intramuscular injection of rhNGF in a murine model of ALS.

Methods: Adult male C57BL/6 mice were used in this study. ALS was induced by injecting intrathecal injections of 40 nmol of rhNGF. The mice were followed for 12 weeks, and behavioral tests, such as rotarod and grip strength, were performed every week. The mice were then sacrificed, and the spinal cords were collected for histological analysis.

Results: The mice that received intramuscular injections of rhNGF showed a significant improvement in their motor function compared to the control group. The behavioral tests showed a significant increase in the time the mice could rotate on the rotarod and in their grip strength. Histological analysis of the spinal cords showed a reduction in the number of neurons in the motor cortex and a decrease in the number of reactive astrocytes.

Conclusion: Intramuscular injection of rhNGF in a murine model of ALS resulted in a significant improvement in motor function and histological changes, indicating that this approach may be a viable treatment for ALS.

19. Aggressive Clinical Behaviour of Histologically Benign Tectal Gliomas

Kenneth Shulman Award Candidate
Jeffrey Pugh, MD, MSc, Vivak Mahto, MD, FRCS, Keith Anson, MD, FRCS (Edinburgh, UK)

Introduction: Tectal gliomas are uncommon, histologically benign tumors. Unlike other posterior fossa tumors, the natural history and optimal management of these lesions is not well described, and many patients require only cerebrospinal fluid (CSF) diversion. Surgery within the dorsal midbrain carries the risk of significant neural injury, while radiotherapy and chemotherapy are limited by the proximity of the tumor to the brainstem.

Methods: We conducted a retrospective review of our experience using a staged resection of supratentorial tumors in children, with a goal of maximizing resection, minimizing morbidity, and optimizing surgical control. First, subdural electrodes were implanted. This was followed by extracranial functional and seizure focus mapping, and subsequently tumor resection.

Results: Between 1999 and 2005, five-year follow-up was available in 17 of 20 patients. Seventeen patients were followed up for an average of 3.5 years, and 14 patients were followed up for more than 4 years. The mean time to follow-up was 5.2 years. The mean Karnofsky performance score was 85% for all patients. The mean time to follow-up was 5.2 years. The mean Karnofsky performance score was 85% for all patients.

Conclusions: To our knowledge, this is the largest series of patients with histologically benign supratentorial gliomas. This study suggests that a staged resection approach is feasible and may be effective in minimizing surgical morbidity and optimizing functional outcomes.
22. Immunoabhoration for Neurological Disease
Alfred F. Oglen, MD (Columbia, New York, NY)
Introduction: Recent advances in the field of immunotherapy are rekindling interest in the treatment of neurological diseases involving immunologic approaches. Along with a comprehensive discussion of the background and rationale regarding immunotherapy for neurological diseases, we present initial findings from analyses of tumors infiltrating lymphocytes and screening of potential antiangiogenic targets.

Methods: Tumor-infiltrating lymphocytes were analyzed after ex vivo preparation of fresh tumor specimens using flow cytometry. A panel of potential tumor-specific antigens from the cancer tests antigen family was assayed by RT-PCR of RNA isolated from tumor specimens.

Results: Ex vivo tumor specimens demonstrated a high proportion of B cells in all lymphoid tissues compared to other kinds of brain tumors. RT-PCR analysis showed 3/5 tumor specimens expressed both MAG-4 and SCPI, but were negative for a range of others including MAG-1 and MAG-3.

Conclusions: MAG-4 and SCPI are two potential antiangiogenic targets for immunotherapy. The presence of a marked B cell infiltrate could be explained by a local cellular expansion. Analysis of variable regions in B cells receptors could support or refute the notion that tumor-infiltrating lymphocytes stem from a specific clonal response that could be manipulated for therapeutic purposes.

23. Myopapillary Epidermoida Long-term Outcome and Treatment
Carrison N. Staal, B.K. Mark, D. Knigge, MD (Rancho, NY), Joa W. Bowen, B.A.; Jordan McComb, MD (Los Angeles, CA)
Introduction: Myopapillary epidermoida is a rare, slow-growing tumor often of the caudal equina area. Previous studies have suggested children are at increased risk for disease dissemination and death.

Methods: To further characterize the long-term outcome of myopapillary epidermoida in the pediatric population, a 27-year retrospective review was conducted.

Results: Eleven patients with myopapillary epidermoida were identified. This included five females and six males between the ages of 9 and 20 years. The average time to follow-up was 5 years. 11(66%) had gross total resection whereas 5(66%) had subtotal resection. 2(25%) patients had secondary disease dissemination on follow-up with an average time to recurrence of 5 years. 2 of the 5(50%) patients with subtotal resection had disease dissemination versus 1 in 7(14%) of those with gross total resection. Radiation therapy did not impact recurrence rates. Of the 3 patients with recurrence, one died of treatment toxicity, and one patient was lost to follow-up. The third patient has been salvaged with chemotherapy with 5 year follow-up.

Conclusions: Myopapillary epidermoida can be effectively treated with gross total resection and no adjuvant therapy. Recurrences may occur in a significantly delayed fashion, requiring long-term surveillance.

24. Intraoperative MRI and the Pediatric Patient: Are We There Yet?
Robert F. Kenting, MD; John S. Myers, MD; Amanda L. Yuen, MD; Derek A. Bruce, MD (Washington, DC)
Introduction: The development of the intraoperative MRI has opened new avenues in pediatric neurosurgery for the treatment of brain and spinal cord tumors, epilepsy, and placement of intracranial catheters. We report our initial experience with 12 pediatric patients undergoing surgical resection of intracranial/spinal lesions and discuss the overall utility and limitations.

Methods: The Posner-10 (2003) Test
Intraoperative MRI (MNI Technologies, 2003) used alone and in conjunction with the Stealth frameless stereotactic system (Medtronic), image acquisition utilized TI, T2 and FLAIR sequences. The number of image acquisitions per surgery, additional time spent, complications and relative efficacy were observed.

Results: Twelve patients (7 M / 5 F) ages 7m to 22 years (1-12 yr) underwent resection of their intracranial/spinal lesion. Lesions treated consisted of 11 brain tumors with 1 patient manifesting concomitant epilepsy, and a solitary lumbosacral meningioma. One patient underwent placement of intraparenchymal catheters for subsequent convection chemotherapy. The number of intraoperative scans ranged from 2 to 8 (x=2.6), with additional operative time involving 2 to 4.5 hours (x=2.8 hr). The MRI was felt to offer a significant overall advantage in 7/10 cases, equitable in 3/10 and not beneficial in 2/10. There were significant complications.

Conclusions: The introduction of real-time imaging capability in the operating area currently offers significant advantages for resection of tumors, placement of intracranial catheters, as well as intraparenchymal tumors. Future improvements in technique and technology will undoubtedly render the intraoperative MRI as an indispensable tool in the pediatric neurosurgeons’s surgical armamentarium.

Hydrocephalus Award Candidate
James F. McAllister, PhD; Xiao Liang, PhD, Anthony Wang, PhD; Haoying Tang, BS, Ting Cao, BS; Steven O. Salyer, PhD; Kelley Bradlitz, BS; Caroline Black, Jie LU, JY; Steven Slocum, PhD (Columbus, OH)
Introduction: Cerebrospinal fluid (CSF) diversion, or shunting through a silicone catheter is the most common treatment for hydrocephalus and is one of the major complications of shunt treatment. Coating with antimicrobial agents on the device surface provides an alternate approach to minimize bacterial cell adherence. Maintaining the structural integrity of the catheter materials and providing a long period of sustained antibiotic release are two important challenges to the development of clinical shunts for long term implantation.

Methods: A new cast molding approach was developed to load the antibiotic rifampin into the silicone precursor before it was cured. The efficacy of this approach was determined in vitro with Staphylococcus epidermidis grown on the silicone samples, and in vivo with intracranial implants.

Results: Cast molding avoided the microstructural changes observed in samples prepared by the conventional diffusion-controlled technique. An estimated 14% of the initial "burst effect" of drug release. In in vitro studies, different morphologies and structures of Staphylococcus epidermidis cultured under aerobic conditions were observed on untreated silicone surfaces (compact multi-layered structures) and rifampin-loaded silicone surfaces (sparately dispersed, simple-layered structures), respectively. Some of the Staphylococcus epidermidis cells which were exposed to the continuously released rifampin were deformed and the secretion of slime was reduced. Consequently, the rifampin loaded silicone provided sustained release for at least 90 days and Staphylococcus epidermidis adhered on control silicon surfaces was decreased significantly.

Conclusions: These results show that rifampin-loaded silicone prepared by the casting molding approach is suitable for future clinical applications and may reduce the incidence of catheter infection.

26. Diagnosis and Management of Growing Skull Fractures: The Memphis Experience
Hydrocephalus Award Candidate
John S. Winestone, MD; Frederick A. Boop, MD; Alaina L. Gross, MD; Michael S. Mihlbaiser, MD; Stephanie L. Einhaus, MD; Robert A. Sanford, MD; The University of Tennessee-Memphis: Semmes-Murphy Neurologic and Spine Institute; LeBonheur Children’s Medical Center (Memphis, TN)
Introduction: Skull fractures account for a significant portion of pediatric head trauma. The pliable skulls of young infants predispose them to fractures which lacerate brain and dura as the bone is pushed into the intracranial space before returning to the initial position. This traps brain and meninges between the fractured edges. In 1995 the senior author coined the term skull burst fracture in an attempt to describe the violent injury. The pulsatian of the trapped neural tissue causes the fracture to grow thereby evolving into a leptomeningeal cyst.

Methods: A retrospective review of pediatric neurosurgeries at our institution revealed 15 cases over a 19 year period.

Results: All patients underwent successful surgery in a subacute manner.

Conclusions: The injury must be identified on presentation in order properly time surgery. MRI was invaluable when the injury was suspected. Operation in the acute time frame is best avoided in light of freshly lacerated brain and torn venous sinuses. The optimal timing is to repair the injury as soon as brain swelling eases. Principles followed include wide craniotomy around the fracture, identification of retracted dura, and replacement of bone exposing healthy osteogenic dura. Extended delay of surgery can lead to leptomeningeal cysts and increased risks of seizures as the dura has had time to scar onto cortex.

27. Ventriculoperitoneal Shunts at Columbus Children’s Hospital
Hydrocephalus Award Candidate
Chris S. Korsa, MD; Scott W. Elton, MD (Columbus, OH)
Introduction: To review all ventriculoperitoneal shunt placements at Columbus Children’s Hospital in order to assess the surgical effectiveness, surgery, and complications of CSF diversion to the subgaleal space.

Methods: 25 infants with hydrocephalus of various etiologies were treated with subgaleal shunting over a period of four years. A retrospective analysis of these cases was performed to evaluate multiple aspects of the procedure. Specifically, the surgical procedure, duration of shunt function prior to shunt conversion, radiologic changes, operative complications, as well as infection are discussed. We have also performed a comparative analysis of shunt placement in the NCU versus the operating room.

Results: Operative complication and infection rates are relatively low despite a population with multiple medical problems including, in some cases, concurrent infectious disease. Revisions, while infrequent, were similarly low risk. Post-implantation imaging confirmed rapid decompression with respect to ventricular size, with relatively long times to subsequent ventricular enlargement. Short anesthesia times and elimination of need for transport of premature infants were the primary benefits of surgery in the NCU.

Conclusion: Ventriculoperitoneal shunting, which can be reliably and safely performed at the bedside, offers a safe and effective temporary measures of treating hydrocephalus of various etiologies.
ORAL ABSTRACTS

28. Vagus Nerve Stimulation Therapy in Patients with Intractable Pain Syndrome. Results from the Vagus Nerve Stimulation Therapy Patient Outcome Registry. Andrew D. Nkosi, MD, PhD, Samuel A. Hughes, MD, PhD, Lisa C. Bond, MD, Hal S. Meltzer, MD (San Diego, CA), Arun P. Kannal, MD (New Haven, CT), Michael L. Apuzzo, MD (Los Angeles, CA), Karen M. Levy, RN, MPH, Michael L. Levy, MD (San Diego, CA).

Introduction: To determine both the effectiveness of vagus nerve stimulation (VNS) therapy among patients with Autism Spectrum Disorder and persistent or recurrent intractable epilepsy.

Methods: Data were obtained from the VNS therapy patient outcome registry. The integrity of the systems for collecting and processing the registry was authenticated by an independent auditing agency.

Results: Two nonconsecutive cohorts were compared; patients tracked in the registry without Autism Spectrum Disorder (ASD) (non-ASD group n = 3832) and those with a diagnosis of ASD and VNS implantation (ASD n = 77). For the ASD group, the median reduction in seizure frequency of 50% was 48% at 3 months and 61% after 12 months of VNS therapy. The median reduction in seizure frequency of 75% was 30% after 1 month and 38% after 12 months. The median reduction in inpatient seizures of 90% was 18% after 3 months and 31% after 12 months. For the non-ASD group overall rates of seizure reduction were 70% after 6 months, 59% after 12 months, 52% at 12 months, 60% at 18 months, and 62.2% at 24 months. Marked improvements in quality of life parameters included a 28% improvement in alertness, a 42% improvement in verbal skills, a 62% improvement in mood, a 49% improvement in achievements and a 30% increase in memory at 12 months follow-up.

Conclusions: The effectiveness of VNS is maintained during prolonged stimulation, and overall seizure control continues to improve with time. Patients with ASD respond as favorably as other patients receiving VNS therapy. In addition, they had substantially improved quality of life.

ORAL ABSTRACTS


Introduction: Standard therapy for intracranial epilepsy involves age-dependent chemotherapeutic and/or radiation therapy. However, data exist which indicate that completely resected supratentorial epileptogenic zones may not require such therapy. The survival of children with VNS-mediated completely resected posterior fossa epileptogenic zones and no such adjunct therapy is presented.

Methods: A retrospective chart review identified 28 children treated for intracranial epileptogenic zones at our institution over a 10-year period.

19 of this overall group had no residual disease after surgical resection as confirmed by MRI. 4 of these patients received neither chemotherapy nor radiation therapy as per the patient’s wishes. These 4 patients ranged in age from 21 months to 6 years at the time of surgery and included 2 girls and 2 boys. 3 of these tumors were infrafrontal. All 4 tumors were of cellular (non-aplastic) type. Follow-up was 11 months, 34 months, and 7 years. Clinical and radiologic surveillance was frequent, with brain and spine MRI at least every six months. None of these patients have to date demonstrated tumor recurrence during the follow-up period.

Conclusions: The benefits of chemotherapy and radiation therapy after incomplete surgical resection are now well-documented. However, the risk of disease recurrence after gross total resection confirmed by MR imaging and neurosurgical impression merits further study, both for infratentorial as well as supratentorial tumors. 30. Children with CNS Tumors Discovered Incidentally after Trauma Gwydri Hughes, BA, Alan R. Cohan, MD, Sharnadha Robinson, MD (Cleveland, OH).

Introduction: Most children with central nervous system (CNS) tumors present with symptoms related to mass effect or hydrocephalus. The records for children at our institution who had tumors discovered incidentally were compared to those children who were symptomatic at presentation. We hypothesized that asymptomatic tumors discovered incidentally would carry a better prognosis.

Methods: Records from children who were newly diagnosed with CNS tumors over a 10-year period were retrospectively reviewed. Follow-up was the most recent contact or death. Two-tailed student t test or Chi square test was used to determine significant differences between symptomatic and asymptomatic (incidental) tumors.

Results: During a 10-year period, 50 children were newly-diagnosed with a CNS tumor. Nine percent (18 of 199) of tumors were discovered incidentally. All but 1 of the incidentally found tumors, the evaluation was precipitated by trauma (8 falls, 2 motor vehicle accidents, 4 sports, one assault). No difference was found between the incidental or symptomatic group in age of presentation, or in proportion of tumors with aggressive pathology. Children with incidental tumors had a higher mortality (22% compared to those with symptomatic tumors 15 percent, Chi-squared test, p = 0.06).

Conclusions: Children who have CNS tumors discovered incidentally do not have a better prognosis than children who present with symptoms. CNS tumors continue to pose a significant threat to children, and additional research is necessary to develop more effective therapeutic strategies, as the prognosis is not necessarily improved by an incidental diagnosis.


Introduction: Sectioning of a thickened filum terminale is a procedure frequently performed by pediatric neuroradiologists, most commonly by a midline approach with a partial or total laminectomy. While the benefits of tethered cord release are well established, the potential impact of disruption of the posterior expansion band (laminea, spinous process, and inter-spinous ligament) is unknown, and may have long-term deleterious effects on development of spinal deformity and/or degenerative disease. A paradoxical approach via laminotomy minimizes disruption of the posterior elements with the potential to reduce the risk of future spinal deformity.

Methods: Division of the filum terminale was affected using a midline approach with the MITEF Tethered System (Sofamor Danek, Memphis, TN). The filum was divided in a standard fashion with the assistance of intraoperative neurophysiological monitoring. Closure and post-operative management were identical to that utilized for a conventional open approach.

Results: Three patients underwent tethered cord release in the manner described. Mean age at the time of surgery was 9 years. Follow-up was 24 months. Mean operative time was 2.5 hours (range 2-3.5). No complications were observed.

Conclusions: Sectioning of the filum terminale can readily be performed via a minimally-invasive approach with available tubular retractor systems. The technique has potential long-term benefits in minimizing spinal deformity and/or accelerated degenerative disease in these patients.

32. Essential Factors of Tethered Cord Syndrome. Shohelay Kamal, MD, Mohammad Reza Fakhrzad, MD (Tehran, Iran).

Introduction: The lesion of tethered spinal cord was clinically located in the lumbosacral cord by Hoffman et al (1991). Yamada et al proved that underlying mechanism of the disorder is impaired oxidative metabolism and electrolytrophysical activity in the same cord segments. The question is asked whether spinal cord elongation or fibrosis thickening (Hoffman's) is main role for causing tethered cord syndrome (TCS).

Methods: 55 pediatric patients with symptoms TCS (younger than 17 years) and 10 adults with TCS, both without spinal dysraphism, were examined for the level of the caudal end of the spinal cord and the diameter of the filum.

Results: Neither cord elongation (caudal end below 12 vertebra) nor filum thickening less than 2 mm were found in 25 children and 30% of adult patients.

Conclusions: The electricity depends on the quality of the spinal cord and filum and their thickness. High viscosity of normal filum allows it to elongate easily during its caudal traction to prevent overstretching of the cord, signifying the importance of filum quality. The elongated cord may indicate overgrowth of the lumbosacral cord in response to vertical tension while its caudal end is anchored by relatively inelastic filum. Only when the filum is replaced by fibrosis andadditional stretching stresses occur, TCS is manifested regardless of the presence or absence of cord elongation. The authors emphasized that signs and symptoms to indicate dysfunction of the lumbosacral cord is essential for diagnosis of TCS. Protocols for TCS symptomatology established in adults TCS can be utilized to effectively diagnose TCS in children.


Introduction: Reports have been published regarding the effectiveness of decompressive craniectomy in severely head injured patients, but few focus on the pediatric population. We present our experience with decompressive craniectomy in pediatric patients.

Methods: This is a retrospective analysis of 14 pediatric (9 males and 5 females, age 7-19 years) decompressive craniectomies performed at our institution from 2002-2005. All patients sustained severe head injury with Glasgow Coma Scale less than 8, and had CT scans demonstrating intracerebral contusions and cerebral edema. Eleven patients received ICP monitors, while three were taken to surgery immediately for evacuation of extra-axial hematomas. Initial ICP's ranged from 4-200 mmHg. All patients received aggressive ventilator management to keep PCO2 30-35, ventilatory drainage, and strict usage of 0.9% NaCl or 3% NaCl to maintain serum sodium 140-150/mg/L. Patients with intracatable ICP greater than 20mmHg throughout the first 24 hours after the Injury were taken to the OR for craniectomy and duralysis. The extent of the craniectomy depended on the size and location of the lesion, extent of cerebral edema and midline shift. ICP monitoring continued throughout the postoperative period. One and six month Glasgow Outcome Scores (GOS) were then assessed.

Results: All patients benefited from the procedure demonstrating reduction of ICP to less than 20mmHg, radiological improvement and neurological recovery. There were no cases of ICP upsurge. The average GOS at one month was 3.8, and at six months was 4.25.

Conclusions: In our series decompressive craniectomy has been shown to produce favorable outcomes with good functional recovery in pediatric patients.
34. Perinatal Brain Injury Impacts Cerebellar Development in Children and Adults

John D. Hill, BA; Shemadonah Robinson, MD
(Cleveland, OH)

Introduction: Perinatal brain injury affects many infants born prematurely. Previously white matter lesions received more attention because they were readily identified by ultrasound. Modern imaging demonstrates that the cerebellum is also affected by prenatal insults, and may contribute to neurologic deficits. We investigated the prevalence of cerebellar underdevelopment in a series of patients with severe perinatal brain injury, and initiated an anatomical study of the pathogenesis of impaired cerebellar development in a rodent model of systemic perinatal ischemia. Methods: Charts of 75 children born prematurely (less than 1500g) with shunted hydrocephalus and imaging after infancy were reviewed and statistical analyses performed. Immunohistochemistry of the cerebellum from postnatal day 15 rats subjected to perinatal ischemia was compared to sham controls. Results: One quarter of the children had significant atrophic fourth ventricular enlargement suggestive of cerebellar underdevelopment, none required第四 ventricular shunting. In MRI rats, parvalbumin labeling showed delayed maturation of Purkinje cells into a single layer in lobe I (n=24, SD 4.4 x 10^11). Conclusions: Perinatal ischemia to cerebellar white matter from post-intrauterine insults results in cerebellar underdevelopment, and from a baseline from which to evaluate the efficacy of neuroprotective agents in ongoing studies.

35. Transcendental Inductive Pressure (TIP) Monitor: Prototype for a Permanently Implanted ICP Device

Kareem Shumaher Award Candidate
Joshua E. Maddox, MD, Berenice J. Sklarad, MD (Madison, WI)

Introduction: The Transcendental Inductive Pressure (TIP) monitor is designed to be a permanently implanted ICP measuring device in patients with shunted hydrocephalus. Current methods of evaluation for ICP disturbances are typically indirect, inaccurate, and often inconstant. The TIP-monitor concept involves a permanent ICP monitor with an ICP sensor that would have a strain-gauge portion placed in the brain parenchyma and an electronic portion placed in the subcutaneous space. No battery is necessary to power the device. The power is delivered instead by an external inductive power supply. An interrogation unit will be placed outside of the head to power the TIP-monitor and receive the signal that it transmits. Methods: An AC voltage/current was used to drive an electromagnetic coil which acted to power the "large-scale" TIP-monitor. A prototype sensor was used in a standard strain-gauge in this prototype. The potentiometer adjustments were used to orthogonally direct signals from the TIP-monitor to the extracranial receiver. Results: The inductive power supply and voltage-to-frequency/frequency-to-voltage conversion signals derived from the TIP-monitor provided a maximum of 3% linearity within the main IC circuitry and boasted exceptional accuracy. Conclusions: The TIP-monitor prototype is a viable concept that proves to be able to power a strain-gauge IC device inductively, because it requires no battery power, it can be small and may have the potential for lasting for a longer period of time when compared to its earlier implantable predecessors. Additional testing and rescaling will be necessary in order to develop the TIP-monitor concept further.

36. Variations in the Nutcracker Filter: Practicalities of the ICP to Arterial Pulse Pressure

Joseph R. Madron, MD, Rui Zou, MD, PhD (Boston, MA)
Michael R. Eger, MD (St. Mary's, MI)
Mark Luciano, MD, Stephen Dombrowski, PhD (Cleveland, OH)
Eric J. McCormick, MD (Winston-Salem, NC)
Mark Wiltgott, MD (Stonybrook, NY)
Dong Kim, MD, Boston, MA

Introduction: Intracranial compliance has important implications in hydrocephalus and other conditions, but its definition (Hf/dP) is not a dynamic entity. A more general formulation is needed to optimally study digitized ICP and ABP waveforms. We explored signal processing approach, time-frequency transfer function (TFFT). Methods: TFFT calculates gain by considering arterial pressure (ABP) as system input and intracranial pressure (ICP) as system output. We calculated the TFFT from anesthetized dogs, (12 normals and 6 with 4-8cm obstructive hydrocephalus), during experimental interventions including hypertension, CSF infusion and CSF removal as analyzed ICP-data from 9 patients. In normal dogs, TFFT reveals a narrow notch filter at the cardiac frequency (n=1/2, 2 dog), supporting the pressure modulation by a Windkessel mechanism [Eigner, 2001]. Spontaneous heart rate changes result in rapid adjustment of the frequency of the notch. In normal dogs, hyperventilation enhances the notch filters [5.8/6 mmHg], CSF infusion reduces the magnitude of notch filter (n=4/4). In hydrocephalic dogs, the notch filters are reduced or absent (-66%), while CSF removal caused partial recovery of the notch filter (64%). The notch was present in only a small fraction of monitored adult patients (1/5). Conclusions: TFFT is a dynamic approach to visualize the intracranial pulsatile dynamics. It is more accurate than compliance measurements to track pressure changes. We calculated from ICP monitoring without need for an invasive infusion test, and instead regard as fluid or creation of hydrocephalus changes the TFFT. Potential predictive and other clinical applications of TFFT are in investigation.

37. Use of Controlled Hypertension and Hypertensive Saline Solutions in Traumatic Brain Injury: Case Study of 16 Pediatric Patients

Stephen A. Fletcher, DO, James E. Baumgartner, DO, Sean T. Meiner, BS, Len Tansaku, MD, Giuseppe Ciocca, MD, Antoine Coat, MD, Nathan Strobel, MD, Lindsey Sharpe, BS (Houston, TX)

Introduction: Current guidelines for the care of traumatic brain injury (TBI) indicate neither preference for mannitol sodium nor hypertonic saline for osmolar therapy. The benefits of using concentrated sodium chloride solutions include the ability to: achieve higher, therapeutic serum osmolal targets, longer duration of action, and ease of maintenance of a constant state. We report the use of controlled intravenous dilution of hypertonic sodium chloride solutions at our institution with 16 pediatric patients. Methods: Data was collected by retrospective chart review from 2002-2004 at an urban Level I pediatric trauma center. Age, sex, injury severity, and mechanism are noted alongside with the use of mannitol. Parameters included were: LOS, mortality, and complications. Results: Sixteen children with TBI received hypertonic saline as bolus doses of 7.5% and 2.5% at a rate of 10mL/kg/h for a total of 3000 mL. In the post-traumatic period, patients underwent 12 injections (2 depths, 1 entry site at a rate of 2 mL/min/site for a total volume of 3800 mL and 1.6 x 10^5 particle units. Results: Six patients have undergone gene therapy for TUNIC, using AAV2/1¼CN2 for a total of 72 injections. All injections were successfully administered without intra- operative complications. There were no post-injection complications, CSF leaks, or significant hemorrhage. Postoperative MRI scans showed variable regions of signal change at the injection sites. Conclusions: Since many children with genetic disorders may be potential candidates for gene therapy, our experience using AAV2/1¼CN2 in the treatment of LINCL has yielded important information regarding the techniques that can be safely employed for reliable, widespread intrathecal administration in the setting of profound global atrophy.

NOMENCLATURE

38. Gene Therapy for Late Infantile Neuronal Ceroid Lipofuscinosis: Surgical Considerations

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Sandra Khodadad, MD, MD, PhD (Tokyo, Japan)
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Introduction: Late infantile neuronal ceroid lipofuscinosis (LINCL) is a fatal childhood disease with no known therapy. LINCL results from a deficiency of tripeptidyl peptidase I (TPI), encoded by the gene CTSF, situated in chromosome 16. LINCL is a degenerative disease of the CNS with storefront accumulation of lipofuscin in neuronal perikarya. No treatment has yet been identified for LINCL. Methods: Patients were selected for surgery after consideration of their clinical status, age, and the location of the advanced deposits of the patients. Results: There are 10 patients with LINCL in this study, ranging from 6 months to 3 years of age, with LINCL stages I and II, respectively. In all patients, the operation was performed on the same day. Methods: Patients were operated on by the same surgical team and were followed up to 3 years. Conclusions: Gene therapy for LINCL using AAV2/1¼CN2 in the treatment of patients with LINCL is possible. The surgical team is able to perform the surgery with minimal complications.
41. Dural Interventions for Moyamoya Disease: Experience with Twenty One Cases

Robert C. Douss, MD, Hakan S. Megahed, MD, Charles W. McCauley, MD, Berman J. Mijalkov, MD (Boston, MA)

Introduction: Moyamoya disease is a disorder characterized by progressive stenosis of the proximal internal carotid artery and its branches. A variety of surgical procedures have been described to accelerate the development of collateral vessels from the external carotid circulation in an effort to prevent ischemic episodes. Studies of the outer perisclerotic layer of the cranial dura is richly supplied by meningeal vessels from the external carotid artery; the inner meningeal dura seems to prevent the ingrowth of these vessels into the ischemic cortex.

Methods: This study employs a new technique in which large dural flaps with preserved blood supply are inverted over the cortical surface to permit direct contact between this vascular outer dura and the brain. Twenty one patients with ischemic or hemorrhagic symptoms ranging in age from three to 23 underwent 31 procedures. In 28 of these cases, endarterectomy/dural autograft (EDAS) was done simultaneously. The seven cases employed only the dural inversion procedure.

Results: All patients had ultimate resolution of ischemic and hemorrhagic symptoms, with no lasting postoperative complications during a follow-up period of 6 to 16 months. Angiograms done an average of 11 months post surgery on 18 in the series showed good to excellent revascularization in all but one hemisphere. Almost all collateral flow arose from the meningeal vessels, with no benefit seen when the superficial temporal artery (STA) was also used.

Conclusions: This procedure is safe, simple and effective in the treatment of moyamoya disease. The simultaneous use of the STA does not seem necessary.

42. The Role of DNA Methylation in CNS Regeneration

Kenneth Shulman Award Candidate

Introduction: We have previously shown that folate acid improves CNS regeneration after injury in a dose-dependent fashion. The goal was to determine the mechanism by which folate acid affects CNS repair. Since 1 major function of the folate pathway is regulating DNA methylation, the effect of CNS injury and folate acid on global DNA methylation was assessed.

Methods: Twenty-eight Sprague-Dawley rats were treated with various combinations of folate acid ranging from 0g/kg to 100g/kg. Beginning three days before injury and continuing daily. The rats were subjected to a C1 dorsal column injury. Four days after the injury, the spinal cords were homogenized and DNA was purified. A global methylation assay was performed. Finally, using the rat spinal cord regeneration model we found that leaf extracts of leaves of nitroso, a specific inhibitor of methionine synthase.

Results: The DNA methylation assay revealed a dose-dependent increase in an inverse parabolic curve with 80g/kg being most effective (1000 cpm/hr vs. 10000 in untreated controls). This corresponded inversely with the dose-response curve obtained from our spinal cord regeneration studies, in which folate acid supplementation caused a biphasic increase in spinal axon regeneration into a peripheral nerve graft, with optimal regeneration occurring at 80g/kg (16% regenerated axons vs. 7% in untreated controls). When methylation pathway was suppressed using nitroso, the effect of folate acid on spinal regeneration was shut down.

Conclusions: We propose that DNA methylation plays a significant role in repair of the injured CNS, and that optimizing methylation through folate supplementation would optimize such repair.

43. Long-Term Motor Outcome Analysis Following Surgical Botulinum Toxin Repair Using a Motor Score Composite Analysis

Kenneth Shulman Award Candidate

Introduction: We have performed 126 Selective Dorsal Rhizotomies (SDR) in the treatment of 144 children between 15 and 19 years with spastic or mixed forms of Cerebral Palsy since July 3rd 2003. We have started our experience with the well recognized SDR in the (tongue)umbilical (SDR-TU) level with excellent results. Much of this is the result of complicated pathology that varies greatly from case to case. There is also a great deal of variation in the type, location and extent of injury. As a result, reporting and follow-up can be cumbersome and inter- and intra-patient comparison can be difficult.

Methods: To define a more efficient system for reporting outcome data, we performed a retrospective analysis of a random subset of 100 (50%) consecutive cases performed by the senior author (TSF). We defined a motor score system based on the patient's ability to sit (0-3), walk (0-3) and used it to report preliminary outcome data. We are in the process of completing the analysis of the remaining patients. SCS was recorded for the initial visit, immediately pre-op, and at several post op time points.

Results: The mean SCS was 0.84 at 6 months post-op, and 0.82 at 12 months post-op and 2 years post-op.

Conclusions: The mean SCS was 0.84 at 6 months post-op, and 0.82 at 12 months post-op and 2 years post-op.

44. Central Selective Dorsal Rhizotomy in the treatment of Spasticity in Children with Cerebral Palsy

Boris Zivin, MD, Stavroula Serva, MD (Czech Republic)

Introduction: We have performed 26 bilateral (SDR) based on preoperative reflex evaluation in children between 3 and 15 years old. The SCS was unilateral procedure done, in 12 patients, SDR was performed bilaterally (SDR-TU and SDR-TL) performed. We have evaluated the functional results 3 to 9 months postoperatively.

Results: There is no complications related to SDR-TL. Functional outcome was found in all children post SDR-TL. The most seen effects are dramatic reduction of upper extremities and further reduction of lower extremities spasticity, rigidity and contractures, dramatic improvement in gross and fine motor skill of the hand extensors, reduction of generalized dystonia, reduction of orofacial spasticity, reduction of hypersalivation and improvement of communicational and cognitive skills.

Conclusions: SCS-DRT-LT is safe and very efficient procedure significantly enhancing the therapeutic possibilities in the treatment of hemi-, tri- or tetra-paretic patients with broad spectrum of severity of their disability. Optimal SDR-TL candidates are the children with spastic hemiplegia in spastic tri- or tetraplegia may be considered for SCS-DRT-LT and SDR-TL. Very efficient and effect of both procedures is more often simply additive.
44. Seizure Control Following Temporal Lobectomy in Childhood Epilepsy at Memorial Hermann Children's Hospital, Houston

James E. Boggs, MD, Joseph Bok, RN, Stephen A. Fletcher, DO (Houston, TX)

Introduction: In the United States, 37,500 children under the age of 18 will be diagnosed with epilepsy each year. Of these children, approximately 6 in 100,000 will become refractory to medical management, yielding 17,000 new cases annually. Temporal lobe epilepsy (TLE) encompasses 10-20% of the cases of intractable epilepsy in pediatric patients, and for some of these patients surgical treatment is an option. We report the surgical outcome of a series of 100 TLE patients ranging in age from 13 months to 17 years of age.

Methods: We performed a retrospective review of 100 patients treated between 1992-2004. The review included chart reviews, telephone interviews, and follow-up clinic evaluations to assess the impact of surgery on seizure control, functional status, and quality of life. A second independent interviewer verified the initial tabulated data.

Results: Over 93% were seizure free at two years following surgery. 64% were seizure free off AEDs, while 63% required AEDs to maintain seizure free status. Approximately 80% took two anti-epileptics or fewer following surgery. Compared to 3.6% prior to surgery. There was an overall surgical complication rate of 12%, and 1 patient with a clotting disorder experienced a small stroke. There was also one case of septic meningitis.

Conclusions: Temporal lobectomy in the pediatric population has proven to be a surgical treatment option with low morbidity and demonstrable efficacy among patients with TLE at this institution.

45. Temporal Lobectomy for Epilepsy in Children: Long-Term Follow Up

Many Bebe, MD, Hiroshi Ohnishi, MD, Carlos Serrad, MD, Khadilyam Sami, MD, Sheila Weiss, MD, Janvi Rakta, MD, PhD (Toronto, ON, Canada)

Introduction: We examined our experience with temporal lobectomy for children with epilepsy at the Hospital for Sick Children, Toronto.

Methods: The Medical Records of all patients who underwent temporal lobectomy and/or lesionectomy for intractable epilepsy were reviewed from 1981-2003.

There were 126 children who underwent temporal lobectomy. Post-operative follow up ranged from 15 to 10 years. The average age at the time of surgery was 13.5 years. The mean interval between the first seizure and surgery was 5.6 years. Sixty two patients had a left temporal lobectomy, and 64 had a right side approach. Sixteen patients underwent resection of the temporal neocortex, 46 had a temporal lobectomy and resection of the mesial structure. Six patients had a lesionectomy only. The pathology for all cases included brain tumors in 63 (50%) patients and cavernous angiomas in four. Gangliogliomas (2 patients - 15%) and astrocytomas (27 patients - 14%) were the most common tumors. Malignant temporal lobe seizures were found in 4 patients (12%), astroglia in 7 (10%), cortical dysplasia in 6 (10%). The general outcome according to Engel classification was grade 1 in 73% of the patients, and grade 4 in 39%. Patients with lesions had better outcome (grade 1 in 82%), as opposed to 64% in non-lesional pathology. The complication rate was 6% and included mainly visual field defects.

Conclusions: Temporal lobectomy for epilepsy in children is an effective and safe procedure which can impact favorably on seizure outcome.

46. Corpus Callosotomy: A Six Year Experience of Clinical Outcomes in Patients with Intractable Epileptic Seizures

Lindsey A. Sharp, BSc, James E. Boggs, MD, Stephen A. Fletcher, DO, David Clarke, MD, Tane T. Mener, BS (Houston, TX)

Introduction: Corpus callosotomy, a surgical therapy interrupting conduction pathways of an epileptic discharge, is indicated for a select group of patients with generalized seizures and status epilepticus. Experience indicates that the risk of recurrence is minimal in eliminating or significantly decreasing seizures in a subset of pediatric epileptic patients.

Methods: Patients ranging from 20 months to 23 years of age were entered into the Texas Comprehensive Epilepsy Center Preoperative MRI studies were compared to post-operative assessments to quantitate the degree of callosal resection. One surgeon performed the surgeries. Outcomes evaluated include surgical results, type and frequency of seizures, use of anti-epileptic drugs, and quality of life.

Results: 54 corpus callosotomies were performed. Three of the patients had both corpus callosotomy and 21 had 100% callosotomy, 6 that were a completion of the former procedure. Fifty percent (27) of patients were predominantly or completely free of the seizure type for which surgery was intended. In this group, the average area of callosal resection was 94%. Forty-one percent (22) of the patients experienced a 50% reduction in seizures with an average callosal resection area of 86%. Seven percent (4) did not improve even with 74% average callosal resection. When more serious seizure events were eliminated, 31% developed simple partial seizures. Acute disconnection syndrome was experienced in 66% of the patients.

Conclusion: Extensive and near complete callosal sectioning provides improvement in the quality of life for these unfortunate pediatric or young adult patients.

47. Vagal Nerve Stimulation in Children Less Than Five Years-Old

R. Shane Tubbs, PhD, Jeffrey P. Blount, MD, Pongtorn Kaniamrador, MD, Sarah Kukel, RN, CPNP; Robert Knowlton, MD; Paul A. Grabb, MD; Martino Babin, MD (Birmingham, AL)

Introduction: Vagus nerve stimulation (VNS) has been used in both adults and older children with varying success.

Methods: We retrospectively reviewed our experience with VNS in children less than five-years-old. The mean age at implantation was 20.5 months. Two patients were less than two-years-old at implantation and two patients were less than one-year-old at their initial surgery. The average follow up time for this group was two years.

Results: Of the patients with long-term follow up, 83% had a decrease in their seizure frequency. Of these, 33% were seizure free, 50% are improved, and 17% have had no change in seizure status at their most recent clinical examination. Age at implantation of the VNS did not seem to correlate with patient success, in this group, atomic seizures were found to respond the best to VNS with cessation of this type of seizure in 33% of patients. No patients were made worse by the procedure and no morbidity was observed related to VNS.

Conclusion: Based on our small patient cohort, it appears that VNS is very safe in young children with life-threatening epilepsy and can be efficacious. Larger groups and other institutional experiences are now needed to verify our findings.

48. Analysis of Age of Onset of Childhood Epilepsy in Children Less Than Five Years-Old

Kenneth Shullman Award Candidate

Ndele Sanai, MD, Karita J. Auguste, MD (San Francisco, CA); Peter S. Fan, MD (Oakland, CA)

Introduction: The natural history of trophic cysts in children remains poorly defined. Many cases remain stable over time, while others dramatically enlarge or become symptomatic.

Methods: To identify patterns of astrocytic cyst growth, we prospectively reviewed a series of 32 children (age 0 - 17 years, mean 5.6 years) from 1999 - 2006 with astrocytic cysts. Unlike immediate surgery was indicated, these patients were observed with repeat CT scans and clinical follow-up every 6 - 12 months (mean follow-up of 2.0 years).

Results: The majority of the lesions were found incidentally (n=7), although headache (n=7) and macrocephaly (n=4) were common presentations. Cysts were typically located in the temporal lobe (n=10), frontal lobe (n=7) and posterior fossa (n=3), although several large lesions were hemispheric (n=4). Overall, 11% required surgical intervention. For those patients with immediate fenestration due to mass effect (n=3) or cyst herniation (n=4), Seven patients eventually required fenestration after serial imaging of their cysts demonstrated spontaneous cyst enlargement. Interestingly, at the time of cyst growth, every patient in this latter group was less than 2 years of age (range 1.3 - 12 months, mean 7.7 months). The mean time to progression of the astrocytic cyst was 5.4 months after presentation (range 1 - 12 months). Open cyst fenestration was completed in 10 patients and endoscopic fenestration was used in one patient who subsequently required a repeat open fenestration.

Conclusions: Our experience suggests that, while infrequent, astrocytic cyst progression is more likely to occur in the youngest patients (2 years) and within 1 year of presentation.
52. Consequences of Oregon’s Cap on Non-Economic Damages in the Healthcare Sector

Monica C. Wethington, MD (Portland, OR)

Introduction: In response to an impending medical liability crisis in the 1980s, the Oregon legislature placed a $500,000 cap on non-economic damages in civil suits in 1987. From 1987 – 1999, the medical liability insurance system stabilized and premiums declined. In 1999, the Oregon Supreme Court overturned the legislation as unconstitutional.

Methods: Surveys, phone calls, conducted by the Oregon Neurosurgical Society and the Oregon Medical Association document the subsequent changes in the medical liability environment and the effect on access to health care.

Results: From 1999-2004, the average demand per claim increased from $500,000 to $1.6 million, with average payment increasing from $247,000 to $470,000. Neurosurgical premiums have more than tripled. 13 of 15 insurance carriers have left, and 9% of neurosurgeons are disillusioned with their level of coverage. Over the past 2 years, 20% of Oregon neurosurgeons have left the state or retired, and 55% are actively exploring relocating. Forty percent have limited their practice, and half have increased referral of complex cases. After a failed attempt at replacing the cap through a ballot measure amending the constitution in 2004, the crisis continues to worsen, particularly in neurosurgery.

Conclusions: Analysis of our neurosurgical survey data reveals the continued detrimental effect of removal of a non-economic damages cap, in contrast to California where the cap legislated in 1975 remains in place.

53. Apoptosis Seems to be the Major Process While Surface and Neuronal Extracellular Layers Detach During Neurulation

Mehmet Selcuk, MD, PhD (Istanbul, Turkey)

Apoptosis seems to be the major process while surface and neuronal extracellular layers detach during neurulation.

Objective: To demonstrate the process of detaching of neural and surface extracellular layers soon after the neurulation completes.

Materials and methods: SPH chicken egg embryos were used to investigate the neurulation procedure. Ten eggs were used as controls. The other ten eggs were opened 20th hour of embryo development and cultured with 2-WAD-FMK (peptide cyclase inhibitor) to investigate the results of the apoptosis inhibition. Embryos were staged and developed up to 48 hours in the culture medium. Detection of apoptotic cells between neural and surface dermal layers immunoreactivity of p53 and TUNEL (Terminal deoxynucleotidyl transferase mediated dUTP nick end Labeling) assay were used.

Results: While control group shows positive immunoreactivity of p53 and TUNEL positive apoptotic cells at the site where the neural folds detach form the surface ectoderm, no TUNEL activity and no detection were detected in apoptosis inhibited group.

Conclusions: As inhibition of apoptosis prevented the detachment of the neural and surface extracellular layers from each other at the end of the neurulation, inhibition of apoptosis seemed to cause a considerable embryological error accounted for congenital dermal sinus tractus maldevelopment.

55. Cerebral Revascularization for the Medically Intractable Patient with Progressive Cerebral Artery Stenosis

Roger Huddler, MD; Lynn Gilkison, RN; Beatrice Gao, MD; Beatrice Files, MD; William Boydston, MD; Andrew Reiner, MD; Kevin Stevenson, MD; Thomas Bum, PhD (Atlanta, GA)

Introduction: Cerebrovascular disease affects between 18-25% of all patients with stable cerebrovascular disease (SCVD). Cerebral infarction is the most common presentation in children and the radiographic appearance in many cases is similar to that seen in idiopathic moyamoya disease.

Methods: We have treated 8 children (4 male, 1 female) with SCVD with progressive ischemic events of the proximal carotid artery despite chronic endovascular therapies. All patients' angiography was examined by the multidisciplinary team. Perivascular revascularization of affected SCVD territories was performed using microsurgical techniques.

Results: All patients were identified by the criteria. Only one patient developed ischemic evidence of venous infarction for reasons that are unclear. Of the 16 patients, 17 patients were operated on.

Conclusions: Revascularization for the medically intractable patient with progressive SCVD is safe, effective, and can prevent progressive ischemic events.
Hydrocephalus Award Candidate
James P. Mcllister, PhD, Kurt Patel, MD, William E. Greer, PhD, Haining Tang, MD, (Demott, MI) Jianwei Xiao, MD, Richard F. Keg, MD (Ann Arbor, MI) Kelly E. Bedard, BS, Carolyn A. Black, KY, S. J. Demott, MD (Demott, MI)

Introduction: Silicone cerebrospinal fluid shunts are used to treat hydrocephalus but current designs lack long-term durability and may not be appropriate for all patients. Over the past decade, there has been growing interest in the use of adjuvant materials to improve the durability of shunts, including the use of gelatin sponge, porous hydroxyapatite, and irradiated polystyrene. These materials have been shown to delay the occurrence of shunt failure and enhance the durability of shunts.

Methods: The current study evaluated the performance of silicone cerebrospinal fluid shunts with and without the addition of gelatin sponge. The shunts were compared to control shunts using a standardized protocol that included long-term follow-up and analysis of clinical outcomes.

Results: The addition of gelatin sponge to silicone shunts significantly prolonged the time to shunt failure compared to control shunts. The addition of gelatin sponge also resulted in a reduction in the rate of infection and the need for revision surgery.

Conclusions: The addition of gelatin sponge to silicone shunts significantly improves their durability and reduces the rate of infection and revision surgery. These findings suggest that gelatin sponge may be a useful adjuvant material for improving the durability of shunts and reducing the risk of shunt failure.

ORAL ABSTRACTS
50. The Nkx2.1 Transgene is Essential to Regeneration of the Adult CNS

Kenneth Shulman Award Candidate
Bennet J. Isakson, MD, Elias Rok, MD, David Sun, PhD, Raghvendra G. Nair, PhD, Harshvardhan, MD (Madison, WI)

Introduction: After injury to the adult CNS, various genes are activated, some of which are related specifically to regeneration of the injured neurons. Here we show that the Nkx2.1 transgene, which is expressed in the developing forebrain, is upregulated after injury.

Methods: We developed a line of transgenic mice expressing a fluorescent protein under the control of the Nkx2.1 promoter. We analyzed the expression of this gene in injured brain tissue using immunohistochemistry and in situ hybridization.

Results: The expression of the Nkx2.1 transgene was increased in injured neurons in the injured brain tissue. The expression of this gene was also increased in injured neurons in the injured spinal cord.

Conclusions: The expression of the Nkx2.1 transgene is increased in injured neurons in the injured brain tissue. This increase in expression may be related to the repair process and the regeneration of injured neurons.

ORAL ABSTRACTS
52. Laser Image Evaluation of Papillae and Intracranial Pressure
Jeffrey E. Canamore, MD; Dennis Roberts, BA, BS, PhD; Gordon Thomas, BA, BS, PhD; Sandra Kosteli, BA, BS, PhD; Vincenzo Mea, MD, (Parkway, NJ)

Introduction: We are evaluating a quantitative method for measuring the severity of papillae to test the hypothesis that this severity is correlated with the intracranial pressure. We have developed this quantitative measure of papillae to provide a reliable method for monitoring hydrocephalus and that increase the intracranial pressure and treatments that reduce it.

Methods: We used a non-invasive method of papillae evaluation that involves the observation of the papillae in the lateral ventricle using imaging techniques.

Results: We have developed a method of papillae evaluation that is feasible for clinical use. This method allows for a rapid and quantitative assessment of the papillae, which can be used to monitor the effectiveness of treatment and to determine the need for further intervention.

Conclusions: The development of this method of papillae evaluation provides a valuable tool for monitoring the effectiveness of treatment in patients with hydrocephalus. This method can be used to monitor the effectiveness of treatment and to determine the need for further intervention.
66. Utility of Antibiotic Impregnated Extraventricular Drains in the Pediatric Population

Hydrocephalus Award Candidate
R. Shane Tubbs, PhD, James Gutz, MD, R. Scott Hammed, MD, Elizabeth Blackburn, RN; John C. Wellington, III, MD, Jeffrey P. Blount, MD, and Jerry Oakes, MD ( Birmingham, AL)

Introduction: Antibiotic impregnated catheters are a new device intended to fight catheter-based infections. Antibiotic impregnated extraventricular drains (EVDs) are now routinely used at our institution; however, the limits of their ability to resist infection and how CSF information may be clouded following routine sampling has not been tested.

Methods: A retrospective review was performed including patients with EVDs placed from August 2004 to May 2005. We reviewed all EVDs used through antibiotic impregnated catheters with cultures of CSF drawn through non-antibiotic impregnated catheters and compared the two cohorts' efficacy. (i.e., there was a decrease in post shunt reimplantation infections at long-term follow-up).

Results: We documented forty-five pediatric patients who had 59 antibiotic impregnated EVDs placed. These patients had many different types of infections and were treated with a non-antibiotic impregnated catheter. From this cohort, eight positive cultures for bacteria were identified and no patient developed a post shunt reimplantation infection at long-term follow-up.

Conclusions: These preliminary data suggest that there is little utility in the use of an antibiotic impregnated catheter for EVD placement. Moreover, sampling of CSF from an antibiotic impregnated catheter may cloud the interpretation of CSF results, perhaps by masking actual infection. This may lead to the premature placement of CSF diversionary shunts.

67. Comparison of Infection Rates with Antibiotic and Non-antibiotic Impregnated Shunt Systems in a Large Series of Pediatric Patients

GREG O'SULLIVAN, MD; Pediatric Neurosurgery Group, University of Miami and Miami Children's Hospital ( Miami, FL)

Introduction: Antibiotic impregnated shunt systems are gaining widespread attention in the pediatric hydrocephalus population. We present our experience with the Bactrex antibiotic shunt system in a series of shunted children and compare with non-antibiotic impregnated shunt systems for their efficacy in reducing shunt infection rates.

Methods: A prospective analysis was performed on 141 patients who underwent surgery at our institution. 78 were monodrug (non-antibiotic) and 63 were Bactrex antibiotic impregnated shunts (78 total and sternal revisions are included, the number is X) procedures total. Each patient for hydrocephalus primary prevention was then infected, or other incidental anomalies. Follow up for each patient was done a month from 3 months with 2 years of follow up.

Results: All 17 of the patients undergoing the consecutive MRI had the transverse by PCR analysis. Of these 21 MRI meningococcal meningitis and ear infections were observed. This study was performed by Infectious. CSF cultures grew Propionibacter from five patients; PCR was negative for each. Clinically, each of these infected patients was not found to be meningococcal meningitis in the follow up period of six months.

Conclusions: PCR is a powerful new tool that can be used in the diagnosis and differentiation of CSF shunt infections. This modality shows good correlation with current methods for diagnosis of meningococcal meningitis. However, it can add benefits of shorter time to diagnosis and treatment of potential CSF infection, specificity, and smaller specimen size.

68. The Programmatic Management of Post-Operative Shunt Infections: Recent Experience in a Single Institution

Edward S. Ahm, MD; Markus Boockland, MD, Benjamin S. Carson, MD, Jon B. Weinert, MD, George J. Jollis, MD ( Baltimore, MD)

Introduction: Post-Operative Infection rates are reported to be between 10% and 20%. This study was performed to determine the efficacy of the Strata valve during our initial experience with it in shunt-dependent children.

Methods: 33 children with a median age of 2.3 years had 61 Strata valves implated. 33 patients received the Strata valve for their first shunt operation while 21 patients received it as a replacement at the time of shunt revision. The most common etiologies of hydrocephalus were intraventricular hemorrhage and congenital hydrocephalus (24% of patients each).

Results: During the study period, there were 12 shunt revisions. Six of these revisions were due to infections and epiduralis requiring removal of the valvular and antibiotics, one gram-negative infection (22% infection rate at a high risk population). One shunt with antibiotic infection became infected to date with gram-negative organism-a patient with a fresh meningococcal wound closure (3.8% rate). The antibiotic shunt was effective in high risk patients with multiple previous shunt infections.

Conclusions: Antibiotic impregnated shunt systems have been used in all cases of CSF infection and have been successful in reducing infections in high risk patients. A very low infection rate compared to our experience with non-antibiotic systems.

69. Late Failure of Endoscopic Third Ventriculostomy (ETV) as a Treatment for Pediatric Hydrocephalus

Hydrocephalus Award Candidate
Brian T. Janikowski, MD; Paul Gaudin, MD; P. D. Addison, MD; FACS; A. L. Albright, MD; Jan P. Pollack, MD (FACS; Philadelphia, PA)

Introduction: Endoscopic third ventriculostomy (ETV) is a well described treatment for hydrocephalus with a low rate comparable to ventriculostomy. We sought to determine factors that play a role in long-term ETV failures.

Methods: Ninety-nine ETVs were completed between 1999 and 2004 in children 19 years of age. The patients were divided by age, etiology of hydrocephalus, previous operative failures, rate of failure, and time to failure.

Results: There was a 60% success rate with a median follow up of 31 months. Twenty-nine 99 patients (20%) failed within three months of ETV Seventeen of 99 patients (17%) failed after three months at a median time of 5.5 months (range 3.3 - 44 months). Young age, prior treatment, and a high grade tumor were associated with failure, but had no significant correlation with late failure. The most common complications of late failure included hardware failure, infection, instability, and lethargy. The most common presenting signs were unchanged or progressive hydrocephalus on imaging, increasing occipital-frontal head circumference, persistent developmental delay, and a "farselectonic".

Conclusion: Long term failure represents a significant complication of ETV. Younger age, history of surgical intervention, and a malignant tumor predict a higher incidence of failure, but have no significant effect upon time to failure. As such, no subgroup of patients appears to be at particular risk of late failure. The observation that ETV's can fail several years after an initially successful procedure suggests that observation of such patients is warranted, similar to that used for patients with indwelling shunts.
70. Pathophysiology of Communicating Hydrocephalus in Cranially-Resistant Experimental Models

Hydrocephalus Award Candidate
JW. J. M.D., Janet M. Miller, PhD, James P. McAllister, PhD, Penrhynhwyth K. Sasanakul, BS, Barnett, Michael R. Eigner, MD; Mark Wisniewski, PhD (Stony Brook, NY); Curt K. Jett, MB, (Canandaigua, NY); and Mark Hasse, PhD (Detroit, MI). Introduction: Communicating hydrocephalus occurs frequently but clinically-relevant animal models amenable to diagnostic imaging and cerebrospinal fluid shunting do not exist.

Methods: Two methods were evaluated using 25% kaolin or saline injected into the subarachnoid space (SAS). For injections into the basilar cisterns (n=7), after anterior exposure of the Cl/Cs, Incisura, blunt 30-30 gauge needle was advanced into the SAS and 20-50% of kaolin was injected. The for the internal exposure n=7, a craniotomy was created over both cerebellar hemispheres. A curved, blunt tip 25G needle was advanced gently into the SAS. After separating the posterior margin of the SAS total of 30% of kaolin was injected.

Results: All rats undergoing kaolin injection maintained normal behavioral activity with no seizures. There were no deaths. No animals showed signs of cerebellar ataxia or any other neurobehavioral abnormalities. The rats did not have any signs of increased intracranial pressure. No signs of hydrocephalus were observed on the postmortem examinations.

Conclusions: These preliminary results suggest that communicating hydrocephalus can be induced with blockage of the cortical SAS and basilar cisterns. The brainstem approach is the most promising because the clinical presentation of communicating hydrocephalus is most often associated with blockage of the basilar cisterns.

71. Effects of Silicone Surface Coatings on Staphylococcus Epidermidis Colonization and Adhesion

Hydrocephalus Award Candidate
James P. McAllister, PhD, Hsuyang Tong, BS, Xiaomei Long, PhD, Ting Cong, BS, Steven Salley, PhD, KV, Simon Ng, PhD (Detroit, MI). Introduction: Surface modifications of silicone have attempted to reduce the incidence of short infections. However, the influence of surface hydrophobicity, roughness, and functional groups on bacterial adhesion has not been fully elucidated.

Methods: Silicone was modified with different biopolymers and silanes, including heparin, hyaluronic acid, octadecylsilane (ODS), and perfluorodecyltriethorosilane (FDTS). The quality and stability of these coatings were examined by contact angle measurements, Fourier transform infrared spectroscopy, X-ray photoelectron spectroscopy, and atomic force microscopy. Bacterial adhesion was quantified using scanning electron microscopy (SEM).

Results: FAS or ODS (contact angle 103.3 ± 1.4 degrees) and heparin or hyaluronic acid (55.5 ± 1.8 degrees) made silicone hydrophilic and hydrophobic, respectively, and these coatings were stable for 30 days. After 4 h incubation, very few Staphylococcus epidermidis were attached to FAS-coated silicone, while large colonies were found on the heparin-coated silicone. After 12 h, a few colonies were observed in the ODS-coated silicone, but no colonies were observed in the hyaluronic acid-coated silicone. FAS/Silicone still showed the least degree of bacterial adhesion. As pH in the presence of bacterial adhesion was 4.1 in the pattern of least to greatest colony counts on the five different surfaces was FAS-CT-CTS-hyaluronic acid-silicone-heparin. After incubation for 12 h, the greatest bacterial adhesion occurred on heparin-coated silicone. Surface roughness did not appear to be a determining factor with overall bacterial adhesion.

Conclusions: FAS-coated silicone surfaces displayed the greatest inhibition of bacterial adhesion and colony formation, but there did not appear to be a direct correlation with hydrophobicity. These findings are helpful for devising novel strategies to reduce stent infections.

72. Inhibitory Effects of Minocycline on Gliosis in the Hydrocephalus-Induced Rat Model

Hydrocephalus Award Candidate
James P. McAllister, PhD, Janet M. Miller, PhD, Alexander G. Shanku, Steven D. Ham, DO (Detroit, MI). Introduction: Persistent gliosis, if present in the hydrocephalic brain, has the potential to alter biomechanical properties, impair central perfusion, and impede neuronal regeneration and plasticity. The purpose of this study was to model the ability of minocycline, a specific inhibitor of glial reactivity, to reduce gliolar scar formation in the H-trial rat model of congenital hydrocephalus.

Methods: Minocycline (10mg/kg/day) or saline in 5% sucrose at a concentration of 5-10mg/ml was administered to three groups of hydrocephalic H-T rats from postnatal days 5, 10, and 15. Days 5-10 correlate with mild to moderate hydrocephalus, while animals become severely hydrocephalic by day 21. Treated animals were compared to age-matched untreated hydrocephalic rats. White and gray matter of the neocortex was processed for immunohistochemistry (biotin, B4 for microglia and Glial Fibrillary Acidic Protein for astrocytes) and analyzed light microscopically and stereologically.

Results: Preliminary data suggest that minocycline administration significantly reduced astrocyte density from 54,270 ± 16,800 cells/mm² in untreated hydrocephalic rats to 18,640 ± 12,000 cells/mm² in the treated hydrocephalic animals. Additionally, minocycline appeared effective in reducing the relative amount of microglia. The reactive morphology of microglia was reduced, especially in the periventricular white matter. There was no apparent effect on ventricular size or cortical mantle thickness.

Conclusions: Overall, our data suggest that minocycline treatment may be effective in reducing the glial response that accompanies ventriculomegaly, and thus may provide an added benefit when used as a supplement to ventricular shunting.

73. Endoscopic Third Ventriculostomy in the Management of Patients with Diffuse Periventricular Gliomas

Hydrocephalus Award Candidate
Paul Klein, MD, Ilhami C. Gumerov, MD, EBC/SCCT (Boston, MA). Introduction: Endoscopic third ventriculostomy (ETV) has become the preferred modality of treatment for obstructive hydrocephalus. However, concerns regarding the size of the pontine cistern and the potential of injury to the basal artery have caused some to advocate against its application in patients with tumors involving the brainstem. We present a series of patients with diffuse pontine gliomas (DPG) and brainstem tumors in whom this procedure was performed. We will discuss the overall results and the technical aspects associated with this procedure.

Methods: Patients were identified and analyzed retrospectively. All procedures were performed by the senior surgeon (LG). 10 patients with tumors involving the brainstem underwent ETV (3 with DPG, one with recurrent ependymoma and one with residual astrocytoma of the cervicomедullary area). All patients had symptoms of increased intracranial pressure although at time of surgery that was not corroborated in the majority. There were no technical difficulties and/or operative complications.

Conclusions: ETV can be performed safely and successfully in patients with tumors in the brainstem. It affords palliation in the terminal stages of the disease in patients with DPG and should be considered in their management.

74. Gray Zone Hydrocephalus and the 30-Centimeter Syndrome

Khaled B. Ally, MD (Giza, Egypt). Introduction: Clinical symptoms and signs of increased intracranial pressure (ICP) may be non-specific and unreliable, or even entirely absent, in hydrocephalic infants and children. Even with a radiological examination, it is often difficult to distinguish between "arrested hydrocephalus" and slowly progressive hydrocephalus requiring treatment.

Methods: In this work, we are presenting 22 children with hydrocephalus, where one or more criteria, clinical or radiological, were missing causing uncertainty of the diagnosis. This condition we collectively termed "gray zone hydrocephalus". We then resorted to ICP measurement and tried to correlate the ICP with the clinical and radiological criteria.

Results: Twelve children proved to have elevated ICP. A group we called "positive gray zone hydrocephalus". The other ten children had normal ICP, which we called "negative gray zone hydrocephalus". Clinical and radiological criteria can be quite deceiving in those groups of patients.

A subgroup of "positive gray zone hydrocephalus" noted. Those were children with ICP around the 30cm water value. They were characterized in this age group and all were previously labeled as having brain atrophy and mental retardation till the ICP measurement was done. We added this clinical presentation the "30cm syndrome".

Conclusions: The clinical and radiological criteria of hydrocephalus can be quite misleading if no direct ICP measurement is carried out. A higher awareness and index of suspicion is needed to detect and treat children with the "30cm syndrome".
102: Cervical Spine Compression in Pediatric Patients with the 22q11 Deletion

Kenneth Shulman Award Candidate
Sureh N. Magge, MD; Donna M. McDonald-McGill, MD; G. G. DiGioia, MD; Shannon L. Hurley, MD; Kerrie S. Dunning, MD; Elaine H. Zacks, MD; Phillip B. Storm; MD; Leslie Sutton, MD (Philadelphia, PA).

Introduction: The 22q11 deletion, formerly described clinically as DiGeorge syndrome, is one of the most common congenital syndromes. The majority of 22q11 deletion carriers have multiple congenital anomalies that are usually asymptomatic. However, 24% of individuals with 22q11 deletion have cervical spine abnormalities that are usually asymptomatic. (Pochetti, J Bone Joint Surgery 86–B(4)) We describe a series of 22q11 deletion patients with cervical spine compression requiring surgery.

Methods: A retrospective review of 79 patients with the 22q11 deletion who were members of a larger cohort of children followed at the Children’s Hospital of Philadelphia.

Results: Of these patients, two had significant cord compression at C1. Each had a high-riding or dysmorphic C1 arch causing posterior subluxation. One presented with symptoms of myelopathy requiring a C1 laminectomy. The other also had C1 instability and required a C1 laminectomy and fusion from occiput to C2. A third patient was followed for escleral imagosination but did not require surgery.

Conclusions: Patients with the 22q11 deletion are known to have a high incidence of cervical spine abnormalities that are usually asymptomatic. While cervical cord compression is rare in the general pediatric population, we describe two patients out of 79 with the 22q11 deletion with cervical cord compression at C1 who required operative decompression. Given that many patients with the 22q11 deletion require surgery to repair cardiac or palatal anomalies, special attention should be given to identify those children with possible cervical stenosis that could put them at risk for hypoxia during surgery.

103: Development and Evolution of Osmotic Therapy at the University of Wisconsin

Kristine Dziurzynski, MD; Bernice Iskandar, MD (Madison, WI).

Introduction: Usage of osmotic agents, such as urea and mannitol, to treat intracranial hypertension was introduced by Dr. Maruch W. Jard in the University of Wisconsin in 1954. This application allowed for the advancement of neurosurgical care and operative technique, becoming a staple of modern practice. The history of how this therapy was developed and applied to neurological patients is reviewed in this presentation.

Methods: Original manuscripts published by Dr. Maruch W. Jard are reviewed to illustrate how the use of urea and mannitol was conceived, developed, and applied to neurological practice.

Results: In 1954 Dr. Jard administered his first dose of urea to a patient with recurrence glaucoma. Over the following years he conducted several clinical studies, all conducted at the University of Wisconsin, describing effects of osmotic agents in treating intracranial hypertension, and brain edema in the operating room to facilitate exposure of the brain. In 1956, Dr. Jard's work was formally presented at the American College of Surgeons, the same year his landmark paper was published in the Journal of the American Medical Association. Several papers followed further exploring the use of osmotic therapy in treating cerebral edema, leading to widespread use of these agents. These studies included first describing the effects of mannitol in treating intracranial hypertension in animals.

Conclusions: The use of osmotic therapy in clinical neurosurgery has enabled advancement of the field to provide treatment of life-threatening problems in addition to reducing the morbidity and mortality of intracranial surgery.

104: 20 Gp Single and Fractionated Radiotherapy Dose Schedules Preparing Pareto-Free Survival in an Experimental Rat Intramedullary Spinal Cord Tumor Model

Justin M. Caplan, BA; Alla Hede, BA; Gustavo Pradilla, MD; Betty Tyler, BA; Fernando Reis, MD; William Pennant, MD; Andrey Volkov, BA; Henry Bren, MD; George Jallal, MD (Baltimore, MD).

Introduction: Radiotherapy has a limited role in the treatment of intramedullary spinal cord tumors (IMTCT). To enhance the efficacy of radiotherapy, its efficacy in a controlled experimental model must be established. In this study we report the efficacy of 20 Gy and single and fractionated radiotherapy dose schedules for the treatment of IMTCT.

Methods: 104 rats were given a Single intramedullary 15Gy gliosarcoma injection (100,000 cells) and randomized into three groups: Group 1-(n=30) received no further treatment. Group 2-(n=30) received 20Gy single-dose external beam radiation by a Control-173 laboratory irradiator on post-operative day 5. Group 3-(n=30) received 20Gy fractionated radiation 4Gy/day on post-operative days 5-9. Animals were evaluated using the Bassoc, Beattie, and Brezina scale and euthanized after onset of deficits for histopathological analysis.

Results: Animals injected with tumor alone (Group 1) showed a median onset of paraparesis of 12-14 days. 20Gy single dose (Group 2) significantly delayed the onset of paraparesis by 15-17 days (p=0.008 vs. control). 20Gy fractionated dose (Group 3) also significantly delayed the onset of paraparesis by 16-18 days (p=0.046 vs. control). There was no significant difference in the delay to paraly in between single and fractionated radiation at 20Gy (p=0.9315).

Conclusions: Control animals consistently developed hind limb paraparesis 12-14 days after tumor injection. Radiotherapy was efficacious in significantly delaying the onset of paraparesis in both a single and a fractionated dose schedule. This study suggests that 20Gy single and fractionated radiotherapy are safe and efficacious in delaying the onset of paraparesis in a rodent IMTCT model and may be used to test the synergistic or additive efficacy of new treatment options.

105: The Diagnostic Yield of Head CT and Non-accidental Trauma Evaluation in Pediatric Head Injury

Daniel K. Hoh, MD; Mark D. Krieger, MD; Michael Tam, B.A; Gordon McCormack, MD (Los Angeles, CA).

Introduction: Head trauma is a major cause of morbidity and mortality in children. The severity of injury can raise questions regarding etiology, prompting further evaluation for non-accidental trauma (NAT). Our objectives were to assess: 1) radiographic findings of intracranial injury, 2) mechanisms of injury in different age groups, 3) NAT evaluation in patients with evidence of intracranial injury.

Methods: We reviewed 188 consecutive cases in a 5 month period of children presenting to an ER with a head CT and head trauma or suspected child abuse. Positive CT findings (ICH, EDH, SOH, SAH) were recorded. NAT evaluation (skull survey, ophthalmologic exam and notification of the Department of Children and Family Services (DCFS) were noted.

Results: CT evidence of intracranial injury was found in 55 of 188 (29%) patients. 14 of 34 (41%) children 1-year of age demonstrated positive CT findings versus 6 of 48 (32%) patients age 1-3 years and 25 of 106 (24%) patients age 3-18 years. Mechanism of injury varied between age groups. Patients 1-year of age suffered low impact falls (70/74, 78%) while children 1-3 years old were involved in motor vehicle accidents (75/75, 100%). NAT evaluation was performed in 18 patients (18 skeletal surveys, 4 ophthalmologic exams), all <5 years old. 1 of 18 (5%) skeletal surveys and 1 of 4 (25%) ophthalmologic exams were positive. DCFS was notified in 12 cases.

Conclusions: Infants are more likely to have intracranial injury with low impact falls, prompting further NAT evaluation in select cases.

106: Intravenous Varix and the Radiologic Assessment of Venous Catheter Placement

William E. Whitehead, MD; Justin Hang; John L. Smith, PhD; MD; Anna Ille, MD (Indianapolis, IN).

Introduction: To assess the inter-observer variability and the radiologic assessment of venous catheter location after first time short-insertion in pediatric patients.

Methods: Three clinicians with experience in the follow up and treatment of pediatric patients with hydrocele, abdominal, thoracic, ventricular catheters on postoperative CT scans in 9% patients. Catheters were classified based on:

1. Location (peritoneal, frontal, horn, body, temporal horn, brain, cistern, third ventricle)
2. Environment, (surrounded by: CSF, touching brain, slit ventricle)
3. Relationship to choroid plexus (touching choroid plexus, not touching choroid plexus)

To assess the inter-observer variability for these three parameters, overall Kappa statistics for nominal variables were calculated.

Results: Substantial inter-observer agreement occurred for venous catheter location (overall Kappa = 0.66), environment (overall Kappa = 0.78), and relationship to choroid plexus (overall Kappa = 0.62). For venous catheter location, environment, and relationship to choroid plexus, all three observers agreed in 67%, 80% and 65% of the cases, respectively.

Conclusions: The radiologic assessment of venous catheter placement shows considerable inter-observer agreement for location, environment and relationship to choroid plexus. This is important to consider when using these variables as surrogates of outcomes or predictors of short survival.

107: Initial Indication of Vagal Nerve Stimulation Due to Lead Test Interpretation Report of Three Cases

Patrick S. Quebede, MD; Ann Christine Dohme, MD (Lebanon, NH).

Introduction: While vagal nerve stimulation (VNS) for management of intractable epilepsy has a low complication rate, we recently discovered that the stimulator can be inadvertently turned on to a high amplitude mode defaulting in the operating room during surgical placement. In this case the family believed that the child suffered injury from this occurrence. We describe the circumstances causing this phenomenon and provide preventive measures.

Methods: A 10-year-old normal girl with severe epilepsy underwent placement of a Cyberonics VNS device. During the standard Lead Test, after 30 seconds, the patient, between the testing wand and the hand-held computer occurred. The Lead Test was then repeated successfully, and the procedure was completed. The patient was observed overnight and had no apparent effects and no long-term.

Two days later, it was discovered that the stimulator had been turned on in a "default " model which included a I-M mode. Once the wand was removed, the patient, who had noted that the child had been intubated, had tried out during sleep, and was less happy. Two additional patients were identified who had similar events; in one case, the patient developed hoarse bradycardia, and the other patient remained asymptomatic. Investigation revealed that interruption of the lead test can trigger the computer to program the generator to a default "on" mode at l-M, four times the usual initial stimulation amplitude.

Conclusions: Interruption of the Lead Test, due to ward movement or electrical interference, can cause inadvertent startup of the VNS. Device interrogation at the conclusion of implantation can prevent this complication.
112: Implantation of Antibiotic- Impregnated Shunt Catheters to Reduce the Risk of Ventriculoperitoneal Shunt Re-Infecion.

Hydrocephalus Award Candidate

Chris S. Kao, MD; Scott W. Ellson, MD (Columbus, OH)

Introduction: The incidence of shunt re-infection after a primary infection is as high as 20% in the literature. Antibiotic-impregnated shunt catheters have been developed to reduce the risk of infection at primary shunt implantation. Because of cost of the catheters, as well as ongoing concerns over antibiotic resistance, we elected to see if placement of antibiotic-impregnated catheters would reduce the risk of shunt re-infection.

Method: A prospective pilot study of antibiotic-coated shunt catheter implantation over a period of three years was performed. During this study, antibiotic-coated shunt patients received dual and/or proximal antibiotic-coated catheter (Bactilastic, Codman, Inc.). Primary and revision shunt infections were confirmed by clinical or imaging evidence of shunt failure, as well as positive culture results. Subsequently, all abscesses were removed and external ventricular drains were placed prior to revision. Catheters were placed for revision of a pre-existing shunt after the infection had been cleared by culture results.

Results: Analysis of shunt-related infection rates post implantation in this group revealed a significantly lower incidence of infection when compared to national and institutional rates. In addition, there was not a significant increase in non-infection complications specific to this form of shunting.

Conclusion: Although this is a pilot study, it appears that antibiotic-coated shunt catheters provide a safe and effective means of decreasing the rate of shunt-related infections in these high-risk populations. Further randomized trials and randomized trials in a larger patient population will more clearly define the utility of these catheters in reducing the risk of shunt re-infection.

113: Novel Technique for Intrathecal Localization of Deep Lesions: An Adjunct to Frameless Stereotaxy

Deeps Soni, MD; Michael Scott, MD; Edward Smith, MD (Boston, MA)

Introduction: Intrathecal stereotaxy has become a powerful tool to assist neurosurgey. However, despite advances in neuronavigational systems, difficulties related to tissue deformation or "brain shift" remain problematic, in ensuring an accurate inertial localization of lesions (particularly deep lesions). Attempts to correct for brain shift, including mathematical models designed to adjust for tissue deformation, intraoperative re-registration of patients using CT/MRI or computer simulators; and "real-time" MRI-guided procedures, have had variable success in increasing localization accuracy.

Unfortunately, these are seldom cost-effective, readily available, or validated in human models.

Methods: We describe a novel technique used to intrathecally localize deep lesions, as an adjunct to a variety of systems. Upon dural opening, a standard ventricular catheter is cut to a length of approximately 2 cm longer than the projected lesion depth, placed on the end of the stereotactic ward/probe, and passed through the cortex to the lesion depth according to the trajectory projected by the system. The probe is then removed from the ventricular catheter sleeve, which can now serve as the trajectory and depth guide for surgically localizing the lesion.

Results: This technique has been employed since 2000 at both Massachusetts General Hospital and Children's Hospital Boston in a wide variety of cases, including tumors, vascular malformations and congenital lesions. The technique adds less than five minutes to the case time. To date, there are no known complications.

Conclusion: We describe a novel, simple, and economical intrathecal technique for accurately localizing deep brain lesions that may be used as an adjunct to most frameless stereotactic systems.

114: Differential Growth Pattern of Arachnoid Cyst Cell Culture on Extracellular Matrix

Cornellis H. Lam, MD, Jung Yoo, MD, Walter C. Low, PhD (Minneapolis, MN)

Introduction: Arachnoid cysts are an important role in protecting the central nervous system. They also form part of the substrate that filters and regulates cerebrospinal fluid. How these cells grow on different extracellular matrix can determine the viability of the cells, predict healing of the cells, and hist at regulatory factors in migration and growth of arachnoid derived tumors such as meningiomas.

Methods: Arachnoid tissue is harvested from patients under IRB approved protocol. Tissue is suspended in D-MEM supplemented with glutamine, 10% FBS, and antibiotics. After dividing the tissue into 1-1mm pieces, it is placed on Nun culture plates that has been plated with fibronectin, collagen, gelatin. As control, virgin plastic immersed with medium was used.

Results: 9 days later, arachnoid cell growth was most marked in the fibronectin plates well followed closely by collagen. Cultures surprisingly did not promote cell adhesion as predicted. Cell growth was seen on the plates plated.

Conclusions: Despite collagen being an important component of the extracellular matrix secreted by the arachnoid cells, externally derived collagen did not seem to encourage cell growth. This could be due to a differential preference for type of collagen by the arachnoid cells. Likewise, growth of arachnoid cells on fibronectin suggests a differential expression of arachnoid cells to extracellular matrix component that could have implications on chemotasis and multiplication of normal as well as tumorous arachnoid derivative.

115: Preoperative Follow-up Study of Percutaneously Diagnosed Central Nervous System Anomalies

Joe Gom Moon, MD, DMSC; Kwan Young Lee, MD, DMSC; Ho Kook Lee, MD; DMSC; Chang Hyun Kim, MD, DMSC; Do Yoon Hwang, MD, DMSC; Seoul, Republic of Korea

Introduction: Although advances in neuroimaging techniques have been useful to diagnose intratheaten central nervous system(CNS) anomalies, its management remains difficult because the natural history and postnatal outcome were not well understood. This study is undertaken to clarify the natural history and postnatal outcome of prenatally diagnosed CNS anomaly.

Methods: Between January 1999 and October 2002 there were 18 cases of a fetus with a CNS anomaly prenatally diagnosed by ultrasonography. In 6 cases, intratheaten magnetic resonance imaging was taken to confirm the findings when ultrasonography was inconclusive. In this prospective follow-up study the authors have applied the "prospective classification of congenital hydrocephalus" proposed by Cleland.

Results: Hydrocephalus was diagnosed in 3 cases at PCHI stage I, in 6 cases at stage II, in 9 cases at stage III. In 6 cases, termination of pregnancy was performed due to severe CNS anomalies. Among these cases, hydrocephalus was diagnosed in 3 cases(100%) at stage I, in 3 cases(50%) at stage II, in 2 cases(22.2%) at stage III. Out of these 8 cases, 5 cases underwent autopsy following parental consent. In the 10 cases who were delivered, 4(40%) patients were operated on the skull. In these 4 patients, hydrocephalus was diagnosed at PCHI stage III (3 fetuses survived, 1 fetus died at 6 months after birth).

Conclusions: The postnatal outcome is significantly poor in the fetuses with CNS anomaly diagnosed in the early gestation. So it is important to diagnose the fetal CNS anomalies in the early stage of gestation and follow up periodically.

116: Prospective Imaging Study in Pediatric Patients after Placement of a 64-point Subdural Grid

kurit T. Auguste, MD; Vincent Gibbons, MD; Paul Allen, MD; Alvin Gupta, MD, PhD (San Francisco, CA)

Introduction: Intracranial speech mapping is an important adjunct to resection of epileptic foci in the dominant hemisphere. Awake cranial resections are limited by patient cooperation in the pediatrics population. While electrocorticography with implanted subdural electrodes is well documented, there are few studies that describe speech mapping in children. We describe the technical details of subdural grid placement, staged craniotomies, and speech testing for language localization in children.

Methods: A large cranial resection - 10 centimeters of the resected superior temporal gyrus, inferior frontal sulcus and origin of the central sulcus. A 64 contact subdural grid is timmered to maximize cortical contact and supplied by strip electrodes. Speech mapping of non-eloquent and eloquent cortex is started on day 2 and/or day 3. Unipolar stimulus begins at 2 millivolts, and is increased until speech arrest occurs during resection.

Results: Two illustrative cases are described. Speech mapping revealed displaced speech cortex in a 6-year-old male. An extensive resection was performed with no effect on language. Mapping demonstrated receptive speech in the posterior temporal lobes and expressive speech in the inferior frontal lobe of a 14-year old male. 5 cm of the left temporal lobe was resected resulting in transient postoperative dysphasia.

Conclusion: The details of operative exposure and extracranial speech mapping in pediatric patients are described and the procedure published with pediatrics language distribution is reviewed. The three- stage protocol of grid placement, mapping and resection is safe and effective treatment for dominant hemisphere lesions in children who may not tolerate intracranial, awake speech mapping.

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56

57
121. Peripheral Pseudoneuromyopathy with Intraparenchymal Hemorrhage Following An Amusement Park Ride: Case Report and Review of Literature

Edward S. Ahn, MD, E. Francois Aldrich, MD (Baltimore, MD), Arthur J. D'Ambra, MD (Chicago, IL)

Introduction: There have been multiple reports of neurological injuries in adults associated with amusement park rides. These injuries most commonly include subdural hematomas, external dislocations, and subarachnoid hemorrhage. While rare, this potential cause of intracranial hemorrhage is of particular interest in the pediatric population due to the high popularity of this activity.

Methods: Case report.

Results: We present the case of an 8-year-old boy who experienced headache and malaise immediately after exiting an amusement park ride. Seven days later he complained of a sudden, severe headache and acted confused. He then became obtunded and developed a non-reactive pupil. Imaging studies revealed a large left frontal hematoma with intraventricular extension. Following resection and placement of an external ventricular drain, cerebral angiography revealed a 3.4 x 1.5 cm partially thrombosed pseudoneuromyopathy arising from the distal portion of the left anterior cerebral artery. A decompressive craniotomy was performed. At surgery a large hematoma was evacuated and infected brain was debried. Attempts to address the pseudoneuromyopathy were prevented by the degree of cerebral edema. Repeat cerebral angiography revealed that the aneurysm no longer filled. Except for a hæmiparesis, the child made an excellent recovery.

Conclusions: We present the rare case of a pericallosal artery pseudoneuromyopathy that developed in a young boy following an amusement park ride. With the high popularity of this activity among the pediatric population, this case illustrates the importance of recognizing amusement park rides as a potential risk factor for children presenting with intraparenchymal hemorrhages.

122. The Superior Sagittal Sinus as an Access Route for Venous Access in an Infant

Enrica F. Bizzini, MD, Patrick Greisman, MD (Burlington, VT)

Introduction: Emergency venous access in a multi-trauma infant in shock can be difficult. Lack of ability to obtain peripheral or central access can lead to death in rare instances.

Methods: We present a case of successful volume resuscitation in 2 weeks old infant via the superior sagittal sinus.

Results: Neurosurgeons are trained to respect and Fear the superior sagittal sinus. Its use in emergency resuscitation has not been reported. As the superior sagittal sinus should remain patent even in a profoundly hypovolemic patient, it is a target for access when other attempts have failed.

Conclusions: The use of this technique should be reserved for emergencies. Moreover, only individuals familiar with venous sinus anatomy and able to handle complications that may arise from the procedure should attempt it.

123. Spinal Cord Gangliogliocytoma Presenting as Juvenile Sclerosing Case Report and Review of the Literature on Idiopathic Sclerosing Lesions

Patrick J. Reid, MD, Howard J. Silverstein, MD (Chicago, IL)

Introduction: Sclerosing lesions are rare, with Sancier and Hambrecht describing a single case in 1961.

Methods: Review of the literature focused on idiopathic sclerosing lesions of the spinal cord and presentation of our case.

Results: Sclerosing lesions of the spinal cord have a number of potential etiologies, including infection, irradiation, vascular compromise, and post-traumatic injury. Our case is the first reported case of a patient with a sclerosing lesion of the spinal cord that did not fit into any of these categories.

Conclusions: Sclerosing lesions of the spinal cord are rare and can present with a variety of clinical symptoms. Early diagnosis and intervention are crucial for optimal outcome.


Jonathan E. Martin, MD (Horsham, PA), Kimberly Bingman, MD (Augusta, GA), Robert F. Keating, MD (Waltham, MA)

Introduction: Feces-keratinization of the proximal thoracic spine is a relatively rare condition that can present with significant neurological deficits.

Methods: We present a case of a 9-year-old boy who presented to the emergency department with complaints of lower back pain and urinary retention.

Results: A computed tomography scan revealed a large, prominent fecal mass within the proximal thoracic spine. The patient underwent a surgical procedure to remove the fecal mass and achieve decompression of the spinal cord.

Conclusions: Early intervention is crucial in cases of feces-keratinization of the proximal thoracic spine to prevent permanent neurological damage.
127. Management of a Pediatric Patient with Complex Skull and Cerebral Spine Fractures Using a Modified Halo-Brace

Kurtis J. Augustin, MD; Nalin Gupta, MD, PhD (San Francisco, CA); Mark E. Eastham, MD (San Jose, CA)

Introduction: A halo brace is a standard technique used to immobilize fractures of the cervical spine. The horse-shoe-shaped crown requires seating of the pins in intact cranial bone. We discuss a modification of the halo brace in a child with an unstable cervical spine fracture and complex skull fractures which prevented standard brace placement.

Methods: The patient is a 22-month-old male who was a pedestrian struck by a motor vehicle. He was neurologically intact but sustained a C2 fracture and linear, comminuted, depressed fractures of the right parietal and temporal bones. In order to safely place the halo brace, the crown was rotated 180 degrees and the pins were offset to avoid the skull fractures. With the crown reversed, multiple pins attached to the skull in the occipital region. A custom-fit foam pad separated these pins from surfaces behind the patient and supported the patient's weight.

Results: Six crown pins were placed and adequate pressure was applied to each without displacing neighboring fractures. Serial X-rays confirmed successful immobilization and fusion of the C2 fracture. The patient's halo was removed after 12 weeks. He remained neurologically intact and his fractures are healed on follow-up imaging.

Conclusion: The halo brace can be modified safely to satisfy the anatomic needs of patients with complex spine and skull fractures. In the setting of a reversed halo crown, we recommend supplementing with padding to protect the posterior pins from contact or weight-bearing.

128. Immediate Complete Resolution of Large Cervico-thoracic Syringomyelia after Third Ventriculostomy

Kenneth Shulman Award Candidate
Ali i. Raja, MD, MS; Carlos A. Guerra, MD; Babith Adlada, MD (Little Rock, AR)

Introduction: Syringomyelia is often associated with intracranial obstructive pathology. A decrease in syrinx size after a posterior fossa decompressive surgery or cerebrospinal fluid diversion procedure usually occurs, and can be seen as early as 2 weeks. Immediate complete resolution of the syrinx has not been reported in the literature.

Methods: A 15-year-old patient with a large cervico-thoracic syrinx underwent third ventriculostomy for hydrocephalus secondary to a brainstem tumor. Magnetic resonance imaging scan on post-operative day 4 showed complete resolution of the syrinx. Details of the illustrative case are presented followed by review of pertinent literature.

Conclusion: Complete resolution of a large cervico-thoracic syrinx after third ventriculostomy over a very short period of time is extremely rare.

129. Skull Base Approaches for Pediatric Brainstem Tumors

Kenneth Shulman Award Candidate
Ali i. Raja, MD, MS; Carlos A. Guerra, MD; Babith Adlada, MD (Little Rock, AR)

Introduction: Tumors of the brainstem represent a challenging group of pediatric brain tumors. We utilize skull base approaches and techniques for treating complex lesions of this region. This enhances the extent of tumor resection by providing a wider operative exposure with minimal brain retraction, leading to better results even in the most difficult cases.

Methods: The choice of the skull base approach used was guided by the location of the tumor, relationship to the surrounding structures, and radiological characteristics. Three illustrative cases are discussed along with a description of the surgical approaches used.

Conclusions: Detailed anatomical knowledge and use of microsurgical skull base techniques enables superior outcomes.

130. Spontaneous craniopharyngioma in a 7-year-old female

Ericka P. Bston, MD; Travis Dumant, MD; Bruce Tramner, MD (Burlington, VY)

Introduction: Ehlers-Danlos syndrome Type IV is an autosomal dominant connective tissue disorder characterized by defective collagen synthesis. This disorder is of particular interest to neurologists and neurosurgeons as it is an increased incidence of cavernous malformation due to excessive fragility of blood vessels.

Methods: We present a unique case of a pediatric patient with a spontaneous epidermal hematoma as the initial presentation of Ehlers-Danlos Type IV and review the relevant literature.

Results: A 7-year-old male presented with a several day history of posterior cervical pain and masticatory and was found to have a spontaneous retro-orbital epidural hematoma with extension caudad to the upper parietal lobe. After extensive evaluation including genetic testing the patient was found to meet criteria for the diagnosis of Ehlers-Danlos Type IV.

Conclusions: It is important to recognize the spectrum of connective tissue disorders as a possible etiology of spontaneous hemorrhage or stroke in the pediatric population. In this subset of patients there are both diagnostic and interventional pitfalls. Additionally, operative intervention can increase morbidity and mortality secondary to vascular fragility and should therefore be undertaken with caution and only when conservative measures have failed.

131. Lamboid Synostosis vs. Positional Molding

Christopher A. Gege, MD, Jogi V. Patil [Orlando, FL]

Introduction: Lamboid craniostenosis is the most rare form of craniostenosis and lies occipital positional molding, which is common, posterior plagiocephaly is seen. The treatments and the effects on the growing brain are very different between the two; thus a clear diagnosis must be made.

Methods: The authors present a case of lamboid craniostenosis with features of positional molding. The infant had the typical parallelogram appearance of occipital positional molding, rather than the teardrop appearance of lamboid synostosis. A bulging anterior fontanelle and inability to palpate the lamboid suture on the associated side required radiographic evaluation, which identified lamboid craniostenosis. A good cosmetic outcome was achieved by posterior cranial resection, which relieved the increased intracranial pressure (normal anterior fontanelle).

Conclusions: The hallmark features in this case of a bulging anterior fontanelle, inability to palpate the lamboid suture, a winking (isolateral) ear, and a skull base lift were important in making the correct diagnosis.
131: Programmable Valve Adjustment Reduction to Exposure to Gait Analysis
Case Report
Holly S. Glomer-Hill, MD, Edward Dudzinski, MD, Patricia Malnani, CNIS, James Chinman, MD, Charles Pekow, MD, Gretchen Sortor, PT, Nancy Ginnering, CNIS (Detroit, MI)
Introduction: The pressure settings of programmable magnetic shunt valves may be inadvertently changed by magnetic fields greater than 0.8 Tesla. We report the case of an 8-year-old girl with hydrocephalus whose programmable shunt was changed after exposure to magnetic gait analysis.
Methods: The patient is an 8-year-old girl with L4-level megalencephalocele and shunted hydrocephalus. She had a ventriculoperitoneal shunt in place with a Codman Medas Programmable valve. At the time of her gait analysis, her setting was 100. She was within the electromagnetic field of the gait-analysis apparatus for approximately 90 minutes. She had no other exposures to magnetic fields. Over the next two days, she was extremely irritable and complained of severe headaches. Skull X-ray showed her valve setting to 70 mmHg. The valve was reprogrammed to 100 mmHg, and her symptoms resolved.
Conclusion: To our knowledge, this is the first report of a gait-analyser apparatus changing the pressure setting of a programmable shunt valve. When patients with programmable shunts undergo gait analysis as part of their physical therapy regimen, skull X-rays should be immediately performed to verify their valve settings.

132: Spinal Cord Neurostimulation for Spinal Cord Injury with Myelomeningocele and Myelomeningocele Repair
Case Report
Faria Atzara, MD, Raymond Abbott, MD, Karen Wisemen, MD, Jacqueline Bello, MD (New York, NY)
Introduction: We present a 5-year-old boy with neurologic dysfunction due to myelomeningocele, who presented with progressive weakness and loss of sensation. He was treated with surgical repair and subsequent improvement.
Methods: A 5-year-old boy with myelomeningocele presented with progressive weakness and loss of sensation. He was treated with surgical repair and subsequent improvement.
Results: The patient has shown significant improvement in his motor function post-surgery.
Conclusion: Surgical repair of myelomeningocele can lead to significant improvement in motor function in children with neurologic dysfunction.

133: Differences in the Timing and Course of Cranial Traction Treatment in Patients with Crouzon Syndrome and Aplasia Syndromes
Soumou Ito, MD; Katsuki Sekido, MD; Hiroshige Sato, MD; Kazuo Yamaguchi, MD; Hiroshi Kanno, MD; Isao Yamamoto, MD; (Tokushima, Japan)
Introduction: The aim of this study is to elucidate differences in timing and course of cranial traction treatment between Crouzon and Apert syndromes with mutations of fibroblast growth factor receptor (FGFR) gene.
Methods: Ten patients with Crouzon and six with Apert syndrome were enrolled in this study. All of the patients underwent molecular genetic investigation for FGFR2 gene. In addition, these sixteen patients had a follow-up period longer than 10 years. We compare the timings and procedures of cranial operations between two syndromes, retrospectively.
Results: In Crouzon syndrome, five of the ten patients underwent first cranial operations including linear craniectomy before one year of age. Eventually, all of these patients underwent fronto-orbital advancement (FOA) before the age of 6 months. In Apert syndrome, 50% of the ten patients required cranial surgeries more than one time. Seven of ten mutations of FGFR2 gene in these patients were related to cystine residues.
Conclusion: In Apert syndrome, all six patients required fronto-orbital advancements before the age of one year. Eventually, all of these patients underwent additional cranial procedures to the age of 3 years because of progression of hypotelorism. The mutations of FGFR2 gene were Ser252Pro in four and Pro333Arg in two patients.
Conclusions: In patients with Apert syndrome, cranial operations were needed earlier and more often than in patients with Crouzon syndrome. Mutations in FGFR2 gene cause both syndromes; however, biological differences between these syndromes may affect their clinical courses.

135: The Transcranial Approach to Posterior Third Ventricle Tumors in Children: Surgical Strategies A Series of 20 Cases
Andrew D. Nguyen, MD, PhD, Samuel A. Hughes, MD, PhD, Lisa C. Baird, MD, Hof S. Metzler, MD, Michael L. Levy, MD, PhD (San Diego, CA)
Introduction: Surgical approaches to posterior third ventricle tumors in children remain controversial. We retrospectively reviewed 37 patients with posterior third ventricle lesions treated via an anterior surgical approach, based on tumor origin and potential endoscopic involvement.
Methods: A total of 37 patients underwent surgical treatment for posterior third ventricle tumors over a ten-year period. Patient age was 3 to 16 years (mean, 5.2 years). 20 of these patients underwent preoperative imaging, and 17 underwent molecular genetic analysis.
Results: The mean length of follow-up was 4.2 years (range, 0.5 to 16 years). Seven patients died during the follow-up period. The overall survival rate was 91.5%.
Conclusion: The transcranial approach is a safe and effective method for treating posterior third ventricle tumors in children. Further studies are needed to determine the optimal surgical approach for these tumors.
139: Injury and Outcomes After Automobile, Motorcycle and All-Terrain Vehicle Injury in Children: An Institutional Review

Mirza N. Bag, MD; FACS; Brandon Keller, BA; John Hayes, MD; Scott Etter, MD; (Columbus, OH)

Introduction: This study was undertaken to compare the outcomes of pediatric patients admitted to our institution for trauma resulting from car, motorcycle and ATV accidents.

Methods: We conducted a retrospective review of Columbus Children's Hospital trauma registry from January 1999 to December 2003. Data from all patients admitted to the emergency room due to motor vehicle accidents were analyzed for a total of 1638 patient records. Gender, age, length of stay, Glasgow-coma score, revised trauma score, disposition and use of a protective device were studied.

Conclusion: Of 1638 patients, 513677% were injured in automobile accidents. 1237% were injured in motorcycle accidents and 228412% were injured in all terrain vehicle accidents. Injuries from all three types peaked during the summer months. Patients involved in motor vehicle crashes presented with significantly worse GCS scores than those injured in motorcycle and all terrain vehicle accidents. Although there was no statistically significant difference in length of stay between all three injury modalities, protective devices were underutilized in all three motor vehicle categories and were associated with significantly higher GCS scores and shorter lengths of stay among patients admitted after automobile accidents. The higher incidence of motor vehicle accidents and the correlation of seat belt use with better outcomes underscores the necessity to improve motor vehicle safety education for children, who are less likely to be restrained as they age.

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Your response and comments to the following questions are needed to assist the Annual Meeting Committee in developing future programs. Your time and effort in completing this evaluation form is appreciated.

NURSES’ SEMINAR

Session Details:

1. Overall, this course was valuable.
   - Excellent
   - Average
   - Poor

2. Overall, the quality of the Nurses’ Seminar was:
   - Excellent
   - Average
   - Poor

3. The faculty allowed enough time for questions/discussion.
   - Excellent
   - Average
   - Poor

4. The quality of the presentation of papers was:
   - Excellent
   - Average
   - Poor

5. Did you find the materials presented were at the right level for your need in practice?
   - YES
   - NO

6. Should this session be offered at future meetings?
   - Yes
   - No

7. What did you learn in this seminar that you will apply to your practice?

8. Overall, how could this session be improved?

9. What other topics and/or speakers would you like to see at future Annual Meetings or courses?

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**Session Details:**

1. Because of the course I am able to:
   - a. Appraise new proposed craniosynostosis procedures, including late vault remodeling and minimally invasive procedures.  
     | Excellent | Average | Poor |
     | A         | B       | C    | D    | E    |
   - b. Describe technical and methodological challenges in evaluating late effects of craniosynostosis surgery.  
     | Excellent | Average | Poor |
     | A         | B       | C    | D    | E    |

2. Topic addressed completely.  
   | Excellent | Average | Poor |
   | A         | B       | C    | D    | E    |

3. Content relevant to my practice.  
   | Excellent | Average | Poor |
   | A         | B       | C    | D    | E    |

4. Sufficient opportunity for questions/discussion.  
   | Excellent | Average | Poor |
   | A         | B       | C    | D    | E    |

5. What did you learn in this seminar that you will apply to your practice?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

6. Overall, how could this session be improved?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

7. What other topics and/or speakers would you like to see at future Annual Meetings or courses?

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**SCIENTIFIC SESSION II: CONGENITAL ANOMALIES**

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<th>Session Details</th>
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<td>1. Because of the course I am able to:</td>
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<td>a. Appraise new observations in the pathophysiology of Chiari</td>
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<td>malformations and tethered spinal cord.</td>
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<td>b. Compare observations in animal models of congenital CNS</td>
<td>A B C D E</td>
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<tr>
<td>anomalies with the human syndromes.</td>
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<tr>
<td>c. Discuss advances in radiographic and electrophysiological</td>
<td>A B C D E</td>
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<tr>
<td>guidance in tethered spinal cord surgery.</td>
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<tr>
<td>2. Topic addressed completely</td>
<td>A B C D E</td>
</tr>
<tr>
<td>3. Content relevant to my practice.</td>
<td>A B C D E</td>
</tr>
<tr>
<td>4. Sufficient opportunity for questions/discussion.</td>
<td>A B C D E</td>
</tr>
</tbody>
</table>

5. What did you learn in this seminar that you will apply to your practice?

6. Overall, how could this session be improved?

7. What other topics and/or speakers would you like to see at future Annual Meetings or courses?

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**SCIENTIFIC SESSION III – TUMORS**

**RATING SCALE**

<table>
<thead>
<tr>
<th>Session Details</th>
<th>Excellent</th>
<th>Average</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Because of the course I am able to:</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>a. Describe new proposed methods of delivery of chemotherapeutic agents to CNS tumors.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>b. Relate preoperative radiographic findings of pediatric brain tumors to long term outcome.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>c. Review techniques of novel gene discovery in pediatric brain tumors.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>d. Formulate the role of presection chemotherapy in selected brain tumors.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>2. Topic addressed completely.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>3. Content relevant to my practice.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>4. Sufficient opportunity for questions/discussion.</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
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5. What did you learn in this seminar that you will apply to your practice?

6. Overall, how could this session be improved?

7. What other topics and/or speakers would you like to see at future Annual Meetings or courses?

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**SCIENTIFIC SESSION IV: TUMORS**

<table>
<thead>
<tr>
<th>Session Details:</th>
<th>RATING SCALE</th>
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<tbody>
<tr>
<td>1. Because of the course I am able to:</td>
<td>Excellent</td>
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<tr>
<td>a. Estimate the value of intraoperative MRI and new techniques of functional mapping on pediatric brain tumor therapy.</td>
<td>A</td>
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<tr>
<td>b. Contrast interstitial delivery of monoclonal antibodies into tumors with polymer release of molecular constituents.</td>
<td>A</td>
</tr>
<tr>
<td>c. Discuss the major morbidities of craniopharyngioma resection in long term follow-up.</td>
<td>A</td>
</tr>
<tr>
<td>2. Topic addressed completely</td>
<td>A</td>
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<tr>
<td>3. Content relevant to my practice.</td>
<td>A</td>
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<tr>
<td>4. Sufficient opportunity for questions/discussion.</td>
<td>A</td>
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<tr>
<td>5. What did you learn in this seminar that you will apply to your practice?</td>
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<td>6. Overall, how could this session be improved?</td>
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**Scientific Session V - Various Technical Topics**

**Session Details:**

1. Because of the course I am able to:
   a. Discuss criteria for diagnosis and technical advances in tethered cord syndrome surgery.
   b. Quantify the value of incidental tumor discovery after trauma in predicting outcome.
   c. Review the value of vagal nerve stimulation in autism.
   d. List pros and cons of early surgery for leptomeningeal cysts.

2. Topic addressed completely:

3. Content relevant to my practice:

4. Sufficient opportunity for questions/discussion:

5. What did you learn in this seminar that you will apply to your practice?

6. Overall, how could this session be improved?

7. What other topics and/or speakers would you like to see at future Annual Meetings or courses?

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**Scientific Session VII: Functional/Miscellaneous**

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<th>Rating Scale</th>
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<tbody>
<tr>
<td>1. Because of the course I am able to:</td>
<td>A B C D E</td>
</tr>
<tr>
<td>a. Compare outcomes in surgical resection of temporal seizure foci, corpus callosotomy, and vagal nerve stimulation.</td>
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<tr>
<td>b. Relate the advantages of navigation techniques in seizure surgery.</td>
<td>A B C D E</td>
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<tr>
<td>c. Indicate potential roles of nanotechnology, including quantum dots, in neurosurgery.</td>
<td>A B C D E</td>
</tr>
<tr>
<td>2. Topic addressed completely.</td>
<td>A B C D E</td>
</tr>
<tr>
<td>3. Content relevant to my practice.</td>
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<tr>
<td>4. Sufficient opportunity for questions/discussion.</td>
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<tr>
<td>5. What did you learn in this seminar that you will apply to your practice?</td>
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<td>6. Overall, how could this session be improved?</td>
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**SESSION VIII: MISCELLANEOUS**

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<thead>
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<tbody>
<tr>
<td>1. Because of the course I am able to:</td>
<td>Excellent</td>
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<tr>
<td>a. Discuss challenges of bringing new technologies such as coated shunts and scanning laser ophthalmoscopy to clinical use.</td>
<td>A</td>
</tr>
<tr>
<td>b. Describe recent advances in surgery for stroke and ischemia in arterial and venous disease.</td>
<td>A</td>
</tr>
<tr>
<td>2. Topic addressed completely.</td>
<td>A</td>
</tr>
<tr>
<td>3. Content relevant to my practice.</td>
<td>A</td>
</tr>
<tr>
<td>4. Sufficient opportunity for questions/discussion.</td>
<td>A</td>
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5. What did you learn in this seminar that you will apply to your practice?


6. Overall, how could this session be improved?


7. What other topics and/or speakers would you like to see at future Annual Meetings or courses?


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**SCIENTIFIC SESSION IX: HYDROCEPHALUS SYMPOSIUM**

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<tbody>
<tr>
<td>1. Because of the course I am able to:</td>
<td>Excellent</td>
</tr>
<tr>
<td>a. Describe the pitfalls of large scale outcomes studies in hydrocephalus.</td>
<td>A</td>
</tr>
<tr>
<td>b. Identify several questionable assumptions made by clinicians in routine care of patients with hydrocephalus.</td>
<td>A</td>
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<tr>
<td>c. Contrast the impetus for innovation in impoverished areas of the world with wealthy industrialized states.</td>
<td>A</td>
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<tr>
<td>2. Topic addressed completely.</td>
<td>A</td>
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5. What did you learn in this seminar that you will apply to your practice?

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**Scientific Session X: Hydrocephalus**

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<tr>
<td>1. Because of the course I am able to:</td>
<td>Excellent</td>
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<tr>
<td>a. Classify potential drug-impregnated catheter devices in shunt function.</td>
<td>A B C D E</td>
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<td>b. Identify a growth factor whose overexpression may cause hydrocephalus.</td>
<td>A B C D E</td>
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<tr>
<td>c. Appraise the effect of endoscopic ventriculotomy and adjustable valves on the clinical treatment of hydrocephalus.</td>
<td>A B C D E</td>
</tr>
<tr>
<td>2. Topic addressed completely.</td>
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### Raimondi Lecture Evaluation

**RATING SCALE**

<table>
<thead>
<tr>
<th>Excellent</th>
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<th>Poor</th>
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<tr>
<td>A</td>
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<td>C</td>
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<tr>
<td>D</td>
<td>E</td>
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</table>

**Session Details:**

1. Because of the course I am able to:
   a. Enumerate the leadership and scientific approach characteristics which accelerated early exploration of Antarctica.
   b. Discuss aspects of the Arctic ecosystem suggesting an importance for biodiversity in the discovery of future pharmaceutical agents.

PLEASE TURN IN EVALUATION FORMS IN EVALUATION DROP BOXES