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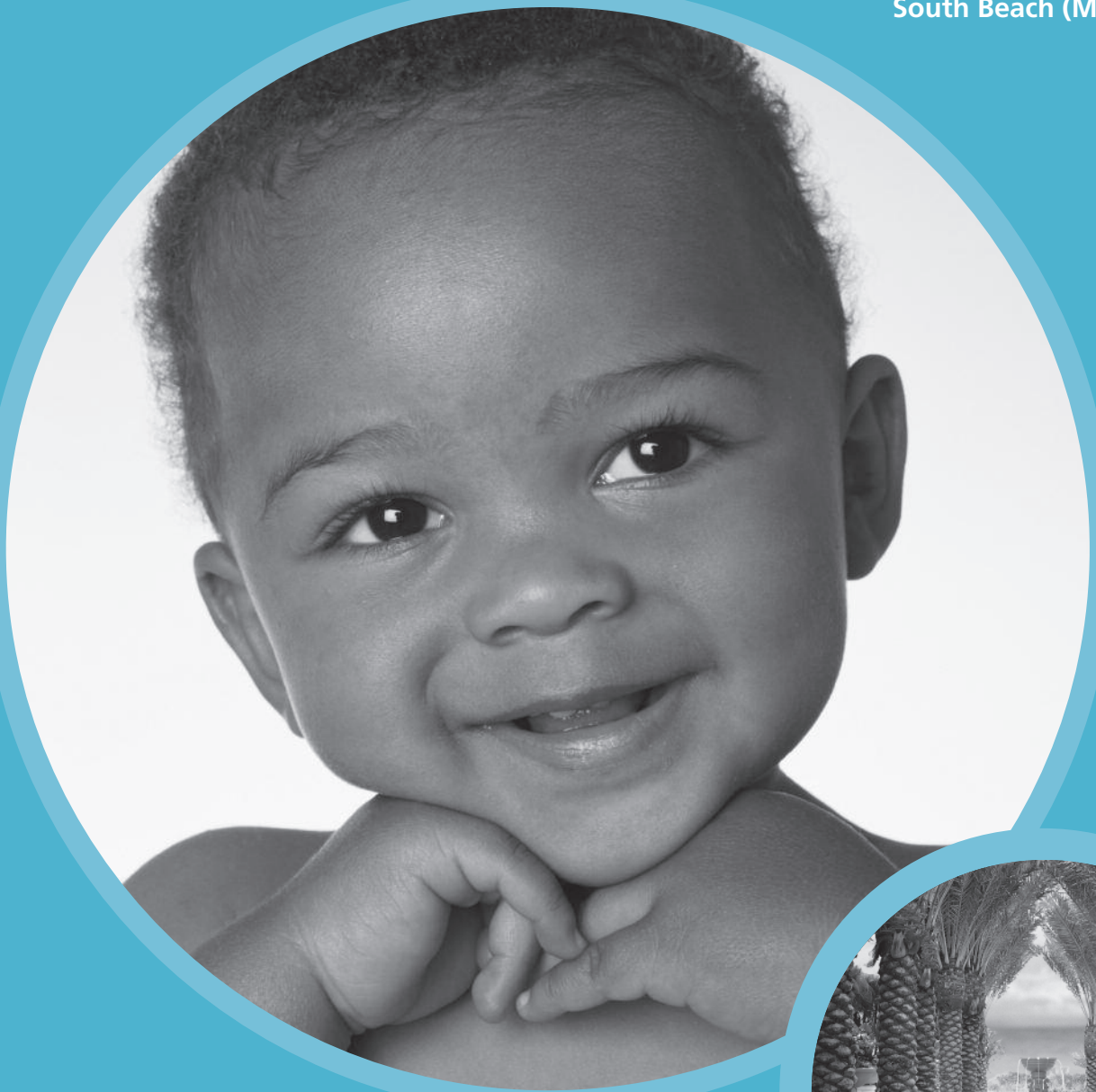
2007 PROGRAM BOOK

THE 36TH ANNUAL MEETING OF THE AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY

November 26–December 1
Loews Miami Beach Hotel
South Beach (Miami), Florida



American Association of Neurological Surgeons

Jointly Sponsored by the AANS

AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY

November 26 – December 1, 2007
South Beach (Miami), Florida

Continuing Medical Education Credit

This activity has been planned and implemented in accordance with the Essentials and Standards of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the AANS and AANS/CNS Section on Pediatric Neurological Surgery. The AANS is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

The AANS designates this educational activity for a maximum of 47.0 *AMA PRA Category 1 Credits*™. Physicians should only claim credit commensurate with the extent of their participation in the educational activity.

Joint Sponsorship Disclaimer

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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 AANS, or its Committees, Commissions or Affiliates.

Annual Meeting Learning Objectives

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

1) Discuss current and new trends in the management of congenital anomalies such as craniosynostosis, spina bifida and the tethered spinal cord

2) Express a new awareness of the nature and management of hydrocephalus

3) Express a new and current awareness of pediatric neurotrauma and its management

4) Express a new and current awareness of pediatric brain tumors and their management

5) Explain new and current techniques in functional neurosurgery for epilepsy and disorders of movement

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CLAIM CME CREDIT THE EASY WAY

Again this year, attendees will self-report CME credit for the programs they attend by going online to MyAANS.org from any computer with internet service. Please have your MyAANS.org username [e-mail address] and password handy during and after the meeting for convenient completion and submission.

Do not self-report CME credit for the optional pre- and post-meeting ticketed events. By turning in your tickets onsite, credit will automatically be added to your record in MyAANS.org.

FUTURE MEETING SITE

2008 Spokane

ANNUAL MEETING SITES

1972 Cincinnati
1973 Columbus
1974 Los Angeles
1975 Philadelphia
1976 Toronto
1977 Cleveland
1978 Philadelphia
1979 New York
1980 New York
1981 Dallas
1982 San Francisco
1983 Toronto
1984 Salt Lake City
1985 Houston
1986 Pittsburgh
1987 Chicago
1988 Scottsdale
1989 District of Columbia
1990 San Diego/ Pebble Beach
1991 Boston
1992 Vancouver, BC
1993 San Antonio
1994 St. Louis
1995 Pasadena
1996 Charleston
1997 New Orleans
1998 Indianapolis
1999 Atlanta
2000 San Diego
2001 New York
2002 Scottsdale
2003 Salt Lake City
2004 San Francisco
2005 Orlando
2006 Denver
2007 South Beach (Miami)

JOINT SECTION OF PEDIATRIC NEUROLOGICAL SURGERY OFFICERS AND COMMITTEES

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1973–74	M. Peter Sayers, MD	1989–91	Donald H. Reigel, MD
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1975–76	Kenneth Shulman, MD	1993–95	Arthur Marlin, MD
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1983–85	Harold J. Hoffman, MD	2005–07	Rick Abbott, MD
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Liliana C. Goumnerova, MD, FRCS(C) (Boston, 2009)

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2007 RAIMONDI LECTURER

ROBERTO C. HEROS, MD

"Reflections on Latin America and the Caribbean"

An active member of the AANS since 1980, Dr. Heros has served as Chair of the Annual Meeting Committee (1990-1991), Chair of the Annual Meeting Scientific Program (1989-1999), Treasurer (1997-2000), President-Elect (2001-2002) and President (2002-2003).

Dr. Heros is Professor and co-chair of the Department of Neurosurgery at the University of Miami, where he also was the founding Director of the International Health Center. He received his medical degree from the University of Tennessee, where he graduated first in his class. Dr. Heros served his surgical internship and residency in neurosurgery at Massachusetts General Hospital/Harvard Medical School.

Dr. Heros is a member of numerous professional societies, including the Congress of Neurological Surgeons (CNS), the Society of Neurological Surgeons, the American Academy of Neurological Surgery, Neurosurgical Society of America, American College of Surgeons and World Federation of Neurosurgical Societies. He also holds honorary memberships in a number of neurosurgical societies abroad, particularly in Latin America. He has been Vice-President of the CNS and President of the American Academy of Neurological Surgery and is the founding Chair of the Neurovascular Committee of the World Federation of Neurosurgical Societies. A visiting professor at nearly 40 universities throughout the United States and abroad, Dr. Heros has authored or co-authored more than 200 scientific journal articles and book chapters and four textbooks on a variety of neurosurgical topics, including intracranial aneurysms, carotid endarterectomy, cerebral arteriovenous malformations, and skull base and brainstem tumors.

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 Nulsen
1986	William F. Meacham
1987	Dale Johnson
1988	Joseph J. Volpe
1989	Martin Eichelberger
1990	George R. Leopold
1991	Judah Folkman
1992	Olof Flodmark
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. Schurtleff
2000	Steve Berman
2001	Alejandro Berenstein
2002	Volker K.H. Sonntag
2003	Jon Huntsman
2004	J. Michael Bishop
2005	James B. McClintock, PhD
2006	Richard D. Lamm

Matson Memorial Lecturers

1987	John Shillito
1988	E. Bruce Hendrick
1989	Martin P. Sayers
1990	Roger Guillemin
1991	Robert L. McLaurin
1992	Joseph Murray
1993	Eben Alexander Jr.
1994	Joseph Ranschoff
1995	John Holter
1996	None
1997	Maurice Choux
1998	Lisa Shut
1999	Gary C. Schoenwolf
2000	Postponed due to illness
2001	Donald H. Reigel
2002	David McLone
2003	Robin P. Humphreys
2004	A. Leland Albright
2005	Joan L. Venes
2006	James P. McAllister James M. Drake Joseph R. Madsen Edward H. Oldfield
2007	Harold L. Rekate

KENNETH SHULMAN AWARD RECIPIENTS

1983 **KIM MANWARING** Neonatal Post-Hemorrhagic Ventriculomegaly: Management with Pulsed Lumbar Cisternostomy

1984 **ARNO FRIED** A Laboratory Model of Shunt-Dependent Hydrocephalus

1985 **ANN-CHRISTINE DUHAIME** The Shaken Baby Syndrome

1986 **ROBERT E. BREEZE** Formation in Acute Ventriculitis

1987 **MARC R. DELBIGIO** Shunt-Induced Reversal of Periventricular Pathology in Experimental Hydrocephalus

1988 **SCOTT FALCI** Rear Seat-Lap Belts. Are They Really "Safe" for Children?

1989 **JAMES M. HERMAN** Tethered Cord as a Cause of Scoliosis in Children with a Myelomeningocele

1990 **CHRISTOPHER D. HEFFNER** Basilar Pons Attracts its Cortical Innervation by Chemotropic Induction of Collateral Branch Formation

1991 **P. DAVID ADELSON** Reorganization of the Cortical-Tectal Pathway Following Neonatal Cerebral Hemispherectomy in Cats

1992 **DAVID FRIM** Effects of Biologically Delivered Neurotrophins in Animal Models of Neural Degeneration

1993 **MONICA C. WEHBY** Metabolic Demonstration of Retained CNS Function in the Rabbit Model of Infantile Hydrocephalus

1994 **ELLEN SHAVER** Experimental Acute Subdural Hemotoma in Infant Piglets

1995 **SEYED M. EMADIAN** Correlation of Chromosome 17p Loss with Clinical Outcome in Patients with Primitive Neuroectodermal Tumors

1996 **JOHN PARK** Platelet Derived Growth Factor Induces Differentiation of Neuroepithelial Stem Cells into Neurons

1997 **MICHAEL J. DREWEK** 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 **SUSAN DURHAM** The Surprisingly Sturdy Infant Brain: Why is it More Resistant to Focal Injury?

2000 **KETAN R. BULSARA** Novel Findings in the Development of the Normal and Tethered Filum Terminale

2001 **DAVID I. SANDBERG** Convection Enhanced Delivery into the Rat Brain Stem: A Potential Delivery for the Treatment of Diffuse Pontine Gliomas

2002 **DAVID ADAMSON** Mechanisms of Reclosure in 2 Surgical Models of Myelomeningocele Implications for Fetal Surgery

2003 **JOSHUA E. MEDOW** Posture Independent Piston Valve: A Practical Solution to Maintaining Stable Intracranial Pressure in Shunted Hydrocephalus

2004 **JOSHUA E. MEDOW** The Permiable Proximal Catheter Project: A Novel Approach to Preventing Shunt Obstruction

2005 **DAVID CORY ADAMSON** Digital Karotyping Identifies a Novel Retinoblastoma Oncogene

2006 **ELIAS B. RIZK, MD** Folate Receptor Function is Essential in CNS Recovery after Injury: Evidence in Knockout Mice

HYDROCEPHALUS ASSOCIATION AWARD RECIPIENTS

1989 **ERIC ALTSCHULER** Management of Persistent Ventriculomegaly Due to Altered Brain Compliance

1990 **S.D. MICHOWIZ** High Energy Phosphate Metabolism in Neonatal Hydrocephalus

1991 **NESHER G. ASNER** Venous Sinus Occlusion and Ventriculomegaly in Craniectomized Rabbits

1992 **MARCIA DASILVA** Reversal of High Energy Phosphate Metabolism Changes in Experimental Hydrocephalus after CSF Shunting

1993 **CHARLES BONDURANT** The Epidemiology of Cerebrospinal Fluid Shunting

1994 **MONICA C. WEHBY-GRANT** 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 Parasagittal Dura: A Cadaveric Study

1996 **MARTHA J. JOHNSON** Reactive Astrocytosis in a New Model of Obstructive Hydrocephalus

1997 No Prize Awarded

1998 **DANIEL LIEBERMAN** In Vetro Detection of Fluid Flow in Ventriculoperitoncal Shunts (VPS) Using Contrast Enhanced Ultrasound

1999 **KIMBERLY BINGAMAN** Hydrocephalus Induces the Proliferation of Cells in the Subventricular Zone

2000 No Prize Awarded

2001 **JAKE TIMOTHY** Treatment of Hydrocephalus Using a Choroid Plexus Specific Immunotoxin: An In Vitro Study

2002 **JOSHUA MEDOW** Quick Brain MRI vs. CT Scan for Evaluating Shunted Hydrocephalu

And **JONATHAN MILLER** Abberant Neuronal Development in Hydrocephalus

2003 **MARTIN U. SCHUHMANN, MD, PhD** Serum and CSF C-Reactive Protein in Shunt Infection Management

2004 **JEFF PUGH** Can the Skull Diploic Space Be Utilized for Absorption of Cerebrospinal Fluid?

And **JAY K. RIVA-CAMBRIN** Pediatric Posterior Fossa Tumors: Pre-operative Predictors of Chronic Hydrocephalus

2005 **JEFFREY P. GREENFIELD** Intraoperative Assessment of Third Ventriculostomy Success

2006 **KURTIS I. AUGUSTE** Greatly Impaired Migration of Aquaporin-4 Deficient Astroglial Cells After Implantation into Mouse Brain

LIFETIME ACHIEVEMENT AWARD WINNER
THURSDAY 10:45 AM

ROBIN P. HUMPHREYS, MD

Dr. Humphreys is a medical graduate of the University of Toronto where he also completed his postgraduate training in neurosurgery. He is a Fellow, Royal College of Physicians and Surgeons of Canada and currently is an Emeritus Professor, Faculty of Medicine at the University of Toronto. He is Past President of the American Society of Pediatric Neurosurgeons, and the International Society for Pediatric Neurosurgery. In 2003, the American Association of Neurological Surgeons invited him as the Donald D. Matson Lecturer.

Dr. Humphreys was appointed to the Department of Surgery at the Hospital for Sick Children (now branded as SickKids) in 1970, when he joined Drs. Bruce Hendrick and Harold Hoffman (after which Mr. Kenneth Till of the namesake hospital in England was to refer to them as "The 3H's in Toronto"). In addition to the characteristic pediatric case load, Dr. Humphreys assumed responsibility for the pediatric cerebrovascular program, and collaborated in the development of Canada's first craniofacial unit. During his 33 years at SickKids where he is now an honorary consultant, he has served as the hospital's neurosurgeon-in-chief, associate surgeon-in-chief and was the inaugural recipient of the Harold J. Hoffman/Shoppers Drug Mart Chair in Paediatric Neurosurgery. In 2003, he received the hospital's Claus Wirsig Humanitarian Award.

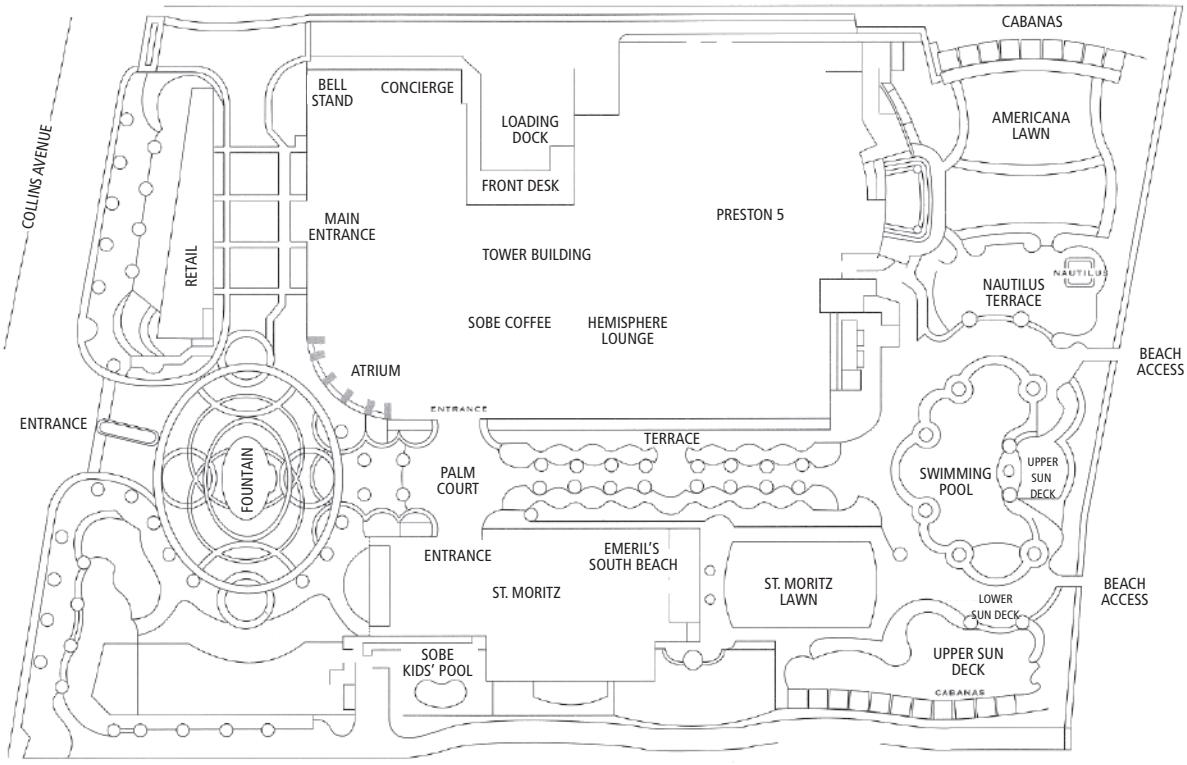
Inspired by his educator grandfather, Dr. Humphreys devoted major portions of his time toward post-graduate education. He has represented the University of Toronto and SickKids by participating in a variety of regional and international post-graduate teaching forums, and recently he has been recalled to teach neuroanatomy to the university's first year medical students.

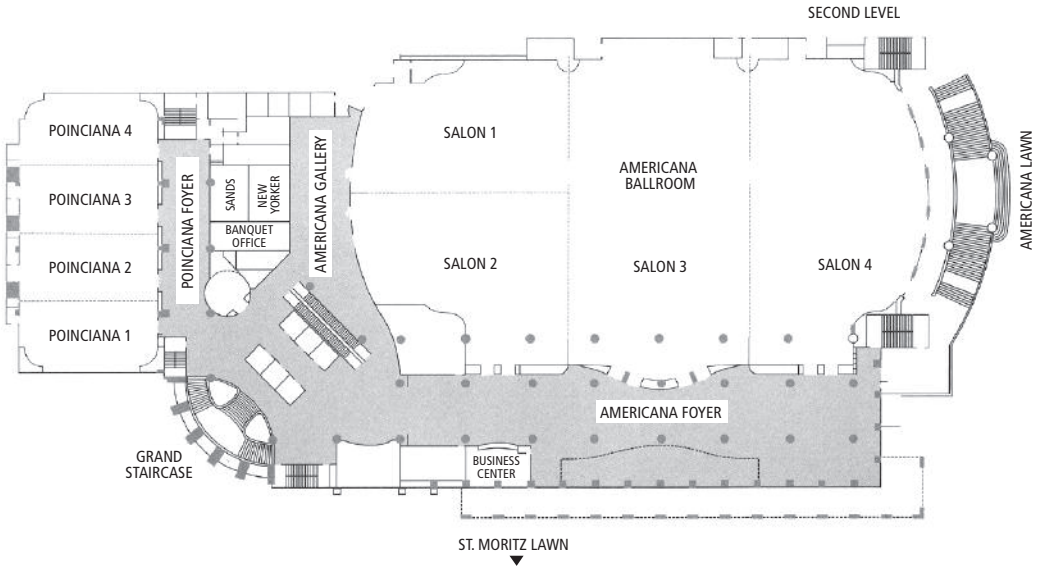
In 2003, Dr. Humphreys joined the Board of Directors of the SickKids Foundation where he serves as chair of the Grants Advisory Committee and its prestigious National Grants Program. Working with Foundation staff, he and his wife Judith have established the Robin and Judith Humphreys Fellowship in Paediatric Neurosurgery, intended to recognize and support neurosurgical education and research accomplishments. Robin and Judith, like so many other senior members of the AANS Pediatric Section, feel very privileged to have been in the "identity age" of children's neurosurgery and witness the creation of pediatric professional organizations such as the Section, as well as the development of specialty specific journals, fellowships, the credentialing process, and on behalf of the children, public advocacy efforts.

PROGRAM AT-A-GLANCE

	TIME	EVENT	LOCATION
MONDAY November 26, 2007	7:00 AM - 4:00 PM	Registration	Rotunda East Lobby
	8:00 AM - 5:00 PM	Pre-Meeting Epilepsy Surgery	Poinciana Salon 1 & 2
TUESDAY November 27, 2007	7:00 AM - 7:00 PM	Registration	Rotunda East Lobby
	8:00 AM - 5:00 PM	Pre-Meeting Nurses' Seminar	Poinciana Salon 1 & 2
	8:00 AM - 1:00 PM	Pre-Meeting Epilepsy Symposium	Poinciana Salon 3
	11:00 AM - 8:00 PM	Exhibit Installation	Americana Salon 3
	6:30 - 8:00 PM	Opening Reception	Americana Lawn
WEDNESDAY November 28, 2007	7:00 AM - 5:30 PM	Registration	Rotunda East Lobby
	7:00 - 8:00 AM	Continental Breakfast	Americana Salon 4 Foyer
	7:50 AM - 12:00 PM	Scientific Sessions	Americana Salon 4
	9:00 AM - 5:30 PM	Exhibit & Poster Viewing	Americana Salon 3
	9:50 - 10:30 AM	Beverage Break in Exhibit Hall	Americana Salon 3
	12:00 - 1:00 PM	Lunch & Poster Viewing in Exhibit Hall	Americana Salon 3
	1:00 PM - 4:30 PM	Scientific Sessions	Americana Salon 4
	2:30 - 3:00 PM	Beverage Break in Exhibit Hall	Americana Salon 3
	4:30 - 5:30 PM	Wine & Cheese Reception in Exhibit Hall	Americana Salon 3
THURSDAY November 29, 2007	7:00 AM - 4:00 PM	Registration	Rotunda East Lobby
	7:00 - 8:00 AM	Continental Breakfast	Americana Salon 4 Foyer
	8:00 - 11:45 AM	Scientific Sessions	Americana Salon 4
	9:00 AM - 4:00 PM	Exhibit & Poster Viewing	Americana Salon 3
	10:15 - 10:45 AM	Beverage Break in Exhibit Hall	Americana Salon 3
	11:45 AM - 1:00 PM	Lunch & Poster Viewing in Exhibit Hall	Americana Salon 3
	12:45 - 5:00 PM	Scientific Sessions	Americana Salon 4
	2:45 - 3:15 PM	Beverage Break in Exhibit Hall	Americana Salon 3
FRIDAY November 30, 2007	7:00 AM - 4:00 PM	Registration	Rotunda East Lobby
	7:00 - 8:00 AM	Continental Breakfast in Exhibit Hall	Americana Salon 3
	7:00 - 10:30 AM	Exhibit & Poster Viewing	Americana Salon 3
	8:00 AM - 1:00 PM	Scientific Sessions	Americana Salon 4
	9:54 - 10:30 AM	Beverage Break in Exhibit Hall	Americana Salon 3
	1:00 - 6:00 PM	Post-Meeting Latin American Symposia	Poinciana Salon 2 & 3
	6:30 - 10:00 PM	Latin American Symposia Dinner	Poinciana Salon 1
SATURDAY December 1, 2007	7:30 AM - 1:30 PM	Registration	Poinciana Prefunction 2 & 3
	8:00 AM - 5:00 PM	Post-Meeting Latin American Symposium	Poinciana Salon 2 & 3

FLOOR PLAN – LOEWS MIAMI BEACH HOTEL





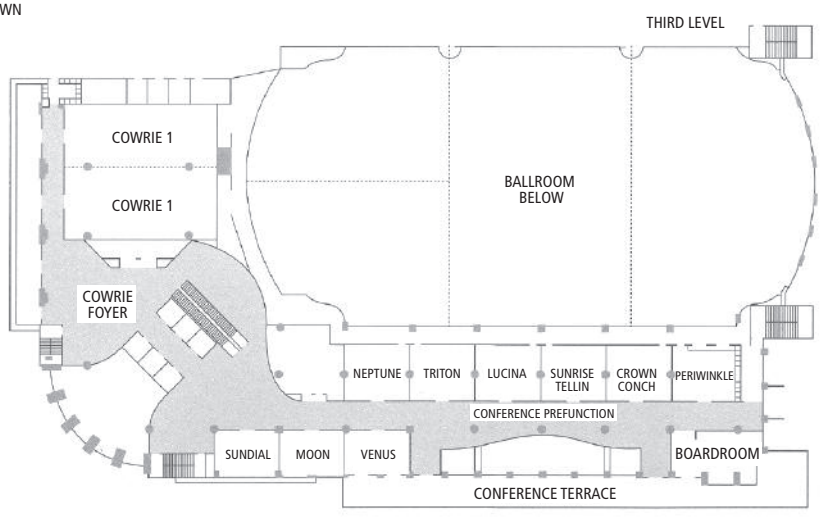
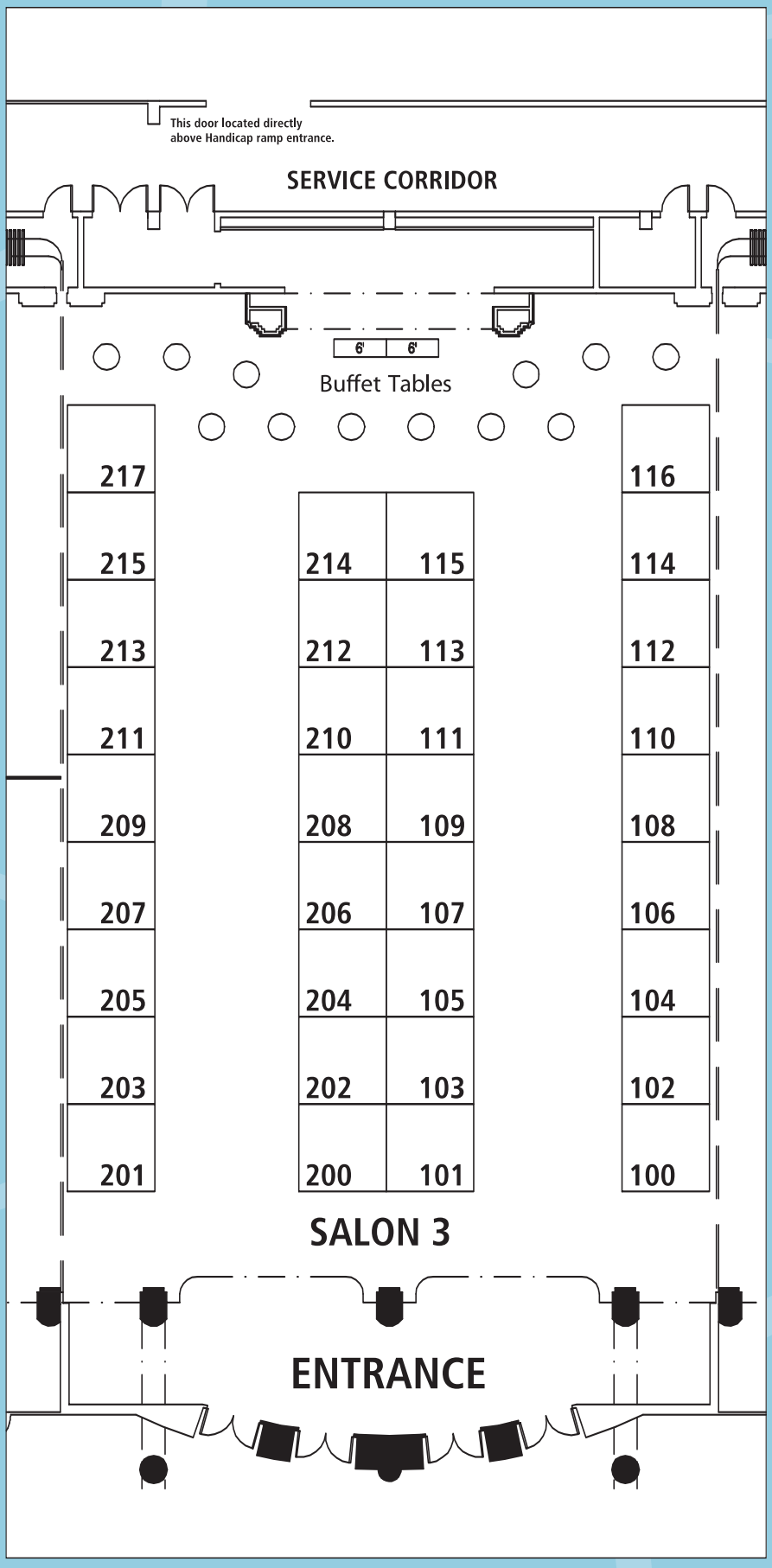


EXHIBIT FLOOR PLAN – AMERICANA BALLROOM SALON 3



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PROGRAM SCHEDULE

PROGRAM DESCRIPTIONS

The open scientific sessions provide participants exposure to the latest in research and groundbreaking information available on neurosurgical topics. The Raimondi lecture will be given by Roberto C. Heros, MD and is entitled "Reflections on Latin America and the Caribbean." Educational programming includes topics such as Craniosynostosis, Congenital Anomalies, Epilepsy/Functional, Hydrocephalus, Tumors and Trauma.

Pediatric Epilepsy Surgery Update

A pre-meeting course on Epilepsy will be held on Monday, November 26th from 7:30 AM – 6:30 PM and Tuesday, November 27th from 8:00 AM – Noon.

Learning Objectives:

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

- Explain the specific issues in the treatment of intractable epilepsy in children
- Describe the malformations of cortical development and how they lead to the development of intractable epilepsy
- Describe the various modalities used to localize and lateralize the area of seizure onset in preparation for surgical treatment of intractable epilepsy
- Describe the controversies in the treatment of nonlesional intractable epilepsy, tuberous sclerosis and dual pathology in children

Nursing Topics in the Tropics

A pre-meeting Nurses' Seminar will be held on Tuesday, November 27th from 8:00 AM – 5:00 PM. This year's course will include a variety of topics presented by a number of invited speakers. A continental breakfast and boxed lunch are included with registration. Nursing contact hours have been applied for. Please contact the Illinois Nurses Association for further information.

Learning Objectives:

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

- Describe signs and symptoms of tethered cord
- Describe at least two barriers to providing medical care to the Transitional Population
- Identify reasons for subdural monitoring
- Identify the importance of early intervention in managing children with TBI
- Outline the non-invasive procedure used to test CSF shunt flow with the Shunt Check

Post-Meeting State of the Art Review: Pediatric Neurosurgery Course with Spanish Translation

A post-meeting course on State of the Art Review: Pediatric Neurosurgery Course with Spanish Translation will be offered on Friday, November 30th from 1:45 – 6:00 PM and Saturday, December 1st from 8:00 AM – 4:45 PM.

Learning Objectives:

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

- Describe how internationally recognized experts manage common and complex pediatric neurosurgical problems
- Review management approaches to pediatric brain tumors, head trauma, spine trauma, craniosynostosis, spasticity, epilepsy surgery, Moyamoya disease, Chiari malformation, complex hydrocephalus, neonatal intraventricular hemorrhage and movement disorders
- Distinguish between strategies which are considered "standard of care" and strategies which are controversial in managing pediatric neurosurgery patients

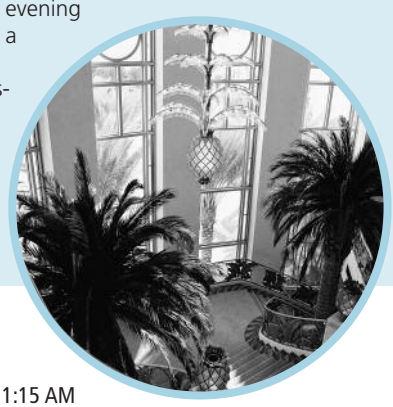
Exhibit Viewing and Poster Sessions

Vendors and their exhibits afford meeting participants an excellent opportunity to view highly specialized equipment and observe first-hand demonstrations of the latest technology available in pediatric neurosurgery.

Poster presentations give interested parties an opportunity to study at their leisure and, at length, the most cutting-edge research performed and documented by leaders in pediatric neurosurgery.

Opening Reception

The opening reception will take place on Tuesday, November 27th from 6:30 – 8:00 PM at the Americana Lawn of the Loews Miami Beach Hotel. Enjoy spending the evening with friends and colleagues over a wonderful assortment of hors d'oeuvres and open bar. All registered attendees and registered guests/spouses receive one complimentary ticket to this event. Resort attire suggested.



PROGRAM SCHEDULE

MONDAY, NOVEMBER 26, 2007

6:45 AM - 4:30 PM
Registration

7:00 - 8:00 AM
Continental Breakfast

7:30 - 10:00 AM
Pediatric Epilepsy Surgery Update: Basic Concepts
Moderator: Prasanna Jayakar, MD, PhD; Michael Duchowny, MD

7:30 - 7:40 AM
Welcome and Introduction
Sanjiv Bhatia, MD, FACS

7:40 - 8:25 AM
Malformations of Cortical Development – Basic Mechanisms
Imad Najm, MD

8:25 - 9:10 AM
Pathology/Pathogenesis of Cortical Dysplasia
Harry V. Vinters, MD

9:10 - 9:55 AM
Basic Mechanisms of Epileptogenesis
Gary W. Mathern, MD

9:55 - 10:15 AM
Question & Answer

10:15 - 10:30 AM
Coffee Break

10:30 AM - 1:00 PM
Pediatric Epilepsy Surgery Update: Newer Technologies
Moderator: Glenn Morrison, MD, FAC; Trevor Resnick, MD

10:30 - 11:15 AM
Role of MR Imaging in the Diagnosis of Pediatric Epilepsy
Nolan Altman, MD

11:15 AM - 12:00 PM
fMRI and Brain Mapping
William Gaillard, MD

12:00 - 12:45 PM
MEG and 3-D Source Localization
James W. Wheless, MD

12:45 - 1:00 PM
Question & Answer

1:00 - 2:00 PM
Lunch

PROGRAM SCHEDULE

2:00 - 4:00 PM
Pediatric Epilepsy Surgery Update: Clinical Aspects
Moderator: Jeffrey G. Ojemann, MD; William Bingaman, MD

2:00 - 2:30 PM
Management of Nonlesional Epilepsy in Children
Prasanna Jayakar, MD, PhD

2:30 - 3:00 PM
Invasive Recording in Pediatric Epilepsy
James T. Rutka, MD, PhD

3:00 - 3:20 PM
Management of Tuberous Sclerosis: Role of Multistaged Resection: Pros
Howard L. Weiner, MD

3:20 - 3:40 PM
Management of Tuberous Sclerosis: Role of Multistaged Resection: Cons
Glenn Morrison, MD, FACS

3:40 - 4:00 PM
Question & Answer

4:00 - 4:15 PM
Coffee Break

4:15 - 6:30 PM
Pediatric Epilepsy Surgery Update: Clinical Aspects
Moderator: James T. Rutka, MD, PhD, James W. Wheless, MD

4:15 - 4:45 PM
Hippocampal Sclerosis and Dual Pathology in Children
Sanjiv Bhatia, MD, FACS

4:45 - 5:15 PM
Callosotomy: Role in the Management of Intractable Epilepsy
James E. Baumgartner, MD

5:15 - 5:45 PM
Vagal Nerve Stimulators - A Useful Therapeutic Option for Seizure Control? Pros
Jeffrey P. Blount, MD, FACS

5:45 - 6:15 PM
Vagal Nerve Stimulators - A Useful Therapeutic Option for Seizure Control? Cons
John Ragheb, MD

6:15 - 6:30 PM
Question & Answer

TUESDAY, NOVEMBER 27, 2007

7:00 AM - 6:45 PM
Registration

7:00 - 8:00 AM
Continental Breakfast

8:00 AM - 12:00 PM
Pediatric Epilepsy Surgery Update: Case Presentations
Moderators: Michael Duchowny, MD; Glenn Morrison, MD, FACS Panelist: William E. Bingaman Jr., MD; Prasanna Jayakar, MD, PhD; Gary W. Mathern, MD; James T. Rutka, MD, PhD; James W. Wheless, MD

This session will be moderated by a panel of epileptologists, radiologists and neurosurgeons.

During this session we plan to present a comprehensive set of representative cases of intractable epilepsy. The clinical semiology, radiological, neuropsychological and electrophysiological data will be presented and a treatment plan discussed. This forum will provide participants the opportunity to learn about the workup, discuss the options of nonsurgical or surgical treatment and learn the various biases of different epilepsy surgery programs.

8:00 AM - 5:00 PM
Nursing Topics in the Tropics

8:00 - 8:10 AM
Welcome/Introduction
Maria C. Penate, RN, BSN

8:10 - 8:20 AM
AANN Overview
Cathy Cartwright, MSN, RN

8:20 - 9:00 AM
Overview of Craniofacial Surgery
S. Anthony Wolfe, MD

9:00 - 9:40 AM
Providing Care for the Transitional Population
Donna C. Wallace, RN, MS, CPNP

9:40 - 10:00 AM
Beverage Break

10:00 - 10:40 AM
Controversies in the Management of Chiari Malformations
David I. Sandberg, MD

10:40 - 11:20 AM
Risky Business: Dangerous Games Children Play
Cathy Cartwright, MSN, RN

11:20 AM - 12:00 PM
Tethered Spinal Cord Syndrome: Diagnosis and Management
Lisa Dubos, MS, APRN, BC

12:00 - 1:00 PM
Lunch

1:00 - 1:20 PM
International Outlook and Outreach – Haiti
Ann McNeil, RN, BSN

1:20 - 2:00 PM
Quality of Life Issues in Pediatric Neurosurgery
Barbara Cechanowicz, RN, MSN

2:00 - 2:40 PM
Presurgical and Surgical Evaluation for Epilepsy
Patricia Dean, ARNP, MSN

2:40 - 3:00 PM
Beverage Break

3:00 - 3:40 PM
Surgical Management of Epilepsy
Glenn Morrison, MD, FACS

3:40 - 4:00 PM
Factors Impacting the Headache Experience of Children with Hydrocephalus
Tina Popov, CNS, NP

4:00 - 4:40 PM
Pediatric TBI: Early Intervention and Continuum of Care
Gillian Hotz, PhD

4:40 - 5:00 PM
Wrap Up & Evaluation

4:00 - 6:00 PM
Speaker Ready Room

6:30 - 8:00 PM
Opening Reception

WEDNESDAY, NOVEMBER 28, 2007

7:00 AM - 4:30 PM
Registration

7:00 - 8:00 AM
Continental Breakfast

7:00 AM - 4:00 PM
Speaker Ready Room

7:50 - 7:55 AM
Welcome and Opening Remarks
Jeffrey H. Wisoff, MD

7:55 - 8:00 AM
Meeting Overview
John Ragheb, MD

8:00 - 8:40 AM
Scientific Session I: Craniosynostosis
Moderators: Philipp R. Aldana, MD; John R. W. Kestle, MD

8:40 - 10:00 AM
Scientific Session II: Congenital Anomalies
Moderators: Sanjiv Bhatia, MD, FACS; David W. Pincus, MD, PhD

9:00 AM - 5:30 PM
Exhibits and Poster Viewing

10:00 - 10:30 AM
Beverage Break in Exhibit Hall

10:30 AM - 12:00 PM
Scientific Session III: General Interest
Moderators: Arthur J. DiPatri Jr., MD; Bruce B. Storrs, MD, FACS

12:00 - 1:00 PM
Lunch and Poster Viewing in the Exhibit Hall

1:00 - 2:30 PM
Scientific Session IV: Epilepsy/Functional
Moderators: Frederick A. Boop, MD, FACS; Glenn Morrison, MD, FACS

2:30 - 3:00 PM
Beverage Break in Exhibit Hall

3:00 - 4:30 PM
Scientific Session V: General Interest
Moderators: David M. Frim, MD, FACS; Ramin J. Javahery, MD

4:30 - 5:30 PM
Wine & Cheese Reception in Exhibit Hall

THURSDAY, NOVEMBER 29, 2007

7:00 AM - 4:00 PM
Registration

7:00 - 8:00 AM
Continental Breakfast

7:00 AM - 4:00 PM
Speaker Ready Room

8:00 - 10:10 AM
Scientific Session VI: Hydrocephalus I
Moderators: Michael R. Egnor, MD; Joseph R. Madsen, MD

PROGRAM SCHEDULE

9:00 AM - 4:00 PM
Exhibits and Poster Viewing

10:15 - 10:45 AM
Beverage Break in Exhibit Hall

10:45 - 10:55 AM
Award Presentation
Lifetime Achievement Award Presentation
Robin P. Humphreys, MD, FRCS(C)

10:55 - 11:00 AM
Introduction of the Raimondi Lecturer by John Ragheb, MD

11:00 - Noon
Raimondi Lecturer

Roberto C. Heros, MD

Reflections on Latin America and the Caribbean

An active member of the AANS since 1980, Dr. Heros has served as Chair of the Annual Meeting Committee (1990-1991), Chair of the Annual Meeting Scientific Program (1989-1999), Treasurer (1997-2000), President-Elect (2001-2002) and President (2002-2003).

Dr. Heros is Professor and co-chair of the Department of Neurosurgery at the University of Miami, where he also was the founding Director of the International Health Center. He received his medical degree from the University of Tennessee, where he graduated first in his class. Dr. Heros served his surgical internship and residency in neurosurgery at Massachusetts General Hospital/Harvard Medical School.

Dr. Heros is a member of numerous professional societies, including the Congress of Neurological Surgeons (CNS), the Society of Neurological Surgeons, the American Academy of Neurological Surgery, Neurosurgical Society of America, American College of Surgeons and World Federation of Neurosurgical Societies. He also holds honorary memberships in a number of neurosurgical societies abroad, particularly in Latin America. He has been Vice-President of the CNS and President of the American Academy of Neurological Surgery and is the founding Chairman of the Neurovascular Committee of the World Federation of Neurosurgical Societies. A visiting professor at nearly 40 universities throughout the United States and abroad, Dr. Heros has authored or co-authored more than 200 scientific journal articles and book chapters and four textbooks on a variety of neurosurgical topics, including intracranial aneurysms, carotid endarterectomy, cerebral arteriovenous malformations, and skull base and brainstem tumors.

Noon - 1:00 PM
Lunch and Poster Viewing in the Exhibit Hall

1:00 - 3:00 PM
Scientific Session VII: Tumor Hydrocephalus
Moderators: David I. Sandberg, MD; Greg Olavarria, MD

3:00 - 3:30 PM
Beverage Break in Exhibit Hall

3:30 - 5:00 PM
Scientific Session VIII: Tumor
Moderators: Andrew H. Jea, MD; Mark D. Krieger, MD

Residents and Young Neurosurgeon Special Session

5:00 - 5:30 PM
3D Anatomy of the Brainstem
Ernesto Coscarella, MD

5:30 – 6:00 PM
Career Paths in Pediatric Neurosurgery: The Road Less Traveled
Speakers: Stephen L. Huhn, MD; Glenn Morrison, MD, FACS; Jeffrey H. Wisoff, MD

5:30 - 6:00 PM
Annual Business Meeting

FRIDAY, NOVEMBER 30, 2007

7:00 AM - 4:00 PM
Registration

7:00 - 8:00 AM
Continental Breakfast in Exhibit Hall

7:00 AM - Noon
Speaker Ready Room

7:00 - 10:30 AM
Exhibits and Poster Viewing

8:00 - 9:30 AM
Scientific Session IX
Moderator: David Harter, MD; Stephen L. Huhn, MD

9:30 - 10:00 AM
Scientific Session X: Trauma/Spine
Moderators: Ann-Christine Duhaime, MD; Thomas G. Luerssen, MD

10:00 - 10:30 AM
Beverage Break in Exhibit Hall

10:30 AM - 12:50 PM
Scientific Session XI: Hydrocephalus II
Moderators: Jeffrey P. Blount, MD, FACS; Jogi Venkata Pattisapu, MD

12:50 - 1:00 PM
Closing Remarks
John Ragheb, MD

State of the Art Review: Pediatric Neurosurgery Course with Spanish Translation

1:00 - 1:45 PM
Lunch for State of the Art Review participants only

1:45 - 5:55 PM
State of the Art Review: Pediatric Neurosurgery Course with Spanish Translation
Moderator: David I. Sandberg, MD

1:45 - 1:55 PM
Welcome
David I. Sandberg, MD

1:55 - 2:40 PM
Neurosurgical Management of Craniopharyngioma
Jeffrey H. Wisoff, MD

2:40 - 3:25 PM
Neurosurgical Management of Moyamoya Disease
R. Michael Scott, MD

3:25 - 4:10 PM
Neurosurgical Management of Spasticity
Rick Abbott, MD

4:10 - 4:25 PM
Beverage Break

4:25 - 5:10 PM
Neurosurgical Approach to Craniosynostosis
J. Gordon McComb, MD

5:10 - 5:55 PM
Pediatric Spine Trauma
Douglas L. Brockmeyer, MD

SATURDAY, DECEMBER 1, 2007

7:00 AM - 1:30 PM
Registration

7:00 - 8:00 AM
Continental Breakfast

8:00 AM - 12:45 PM
State of the Art Review: Pediatric Neurosurgery Course with Spanish Translation
Moderator: David I. Sandberg, MD

8:00 - 8:45 AM
Pediatric Head Trauma
P. David Adelson, MD, FACS

8:45 - 9:30 AM
Neonatal Intraventricular Hemorrhage
Greg Olavarria, MD

9:30 - 10:15 AM
Management of Complex Hydrocephalus
James M. Drake, MD

10:15 - 10:30 AM
Beverage Break

10:30 - 11:15 AM
Epilepsy Surgery in Children
Glenn Morrison, MD, FACS

11:15 AM - 12:00 PM
Management of Chiari Malformations
W. Jerry Oakes, MD

12:00 - 12:45 PM
In-Utero Neurosurgical Interventions
Leslie N. Sutton, MD

12:45 - 1:30 PM
Lunch

1:30 - 4:45 PM
State of the Art Review: Pediatric Neurosurgery Course with Spanish Translation
Moderator: David I. Sandberg, MD

1:30 - 2:15 PM
Neurosurgical Management of Movement Disorders in Children
A. Leland Albright, MD

2:15 - 3:00 PM
Endoscopic Management of Pediatric Brain Tumors
Mark M. Souweidane, MD

3:00 - 3:15 PM
Beverage Break

3:15 - 4:00 PM
MRI Spectroscopy of Pediatric Brain Tumors
Mark D. Krieger, MD

4:00 - 4:45 PM
Management of Posterior Fossa Tumors in Children
David I. Sandberg, MD

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ORAL ABSTRACTS INDEX

Wednesday, November 28, 2007

Scientific Session I: Craniosynostosis

8:00 - 8:10 AM

1. **Comparison Of Perceptions And Treatment Practices Between Neurosurgeons And Plastic Surgeons For Infants With Deformational Plagiocephaly**
   Andrea Van Pelt, MD; David D. Limbrick, MD, PhD; Albert S. Woo, MD; Alex A. Kane, MD; Matthew D. Smyth, MD; Amy Lee, MD (St. Louis, MO)

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2. **Craniofacial Reconstruction As Treatment For Increased Intracranial Pressure**
   Lissa C. Baird, MD; Allen Ho; Lars Evers; Landon Pryor, MD; Nathalie LeFloch, RN, NP; Hal Meltzer, MD; Steven Cohen, MD; Michael L. Levy, MD, PhD (San Diego, CA)

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3. **Use And Risk Profile Of Standard (non-fast Resorbing) Macropore Absorbable Plate System In Pediatric Neurosurgery**
   Jeffrey Pugh; Sarah Kelley; John Wellons; John Grant; Peter Ray; Jeffrey P. Blount (Birmingham, AL)

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4. **Epilepsy As A Comorbidity In A Pediatric Spina Bifida Population**
   R. Shane Tubbs; W. Jerry Oakes; Jeffrey Blount; John Wellons; Sarah V. Kelley; Chevis Shannon; Jeffrey Pugh; Leslie Ackapo-Satchivi (Birmingham, AL)

Scientific Session II: Congenital Anomalies

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5. **Tethered Cord Release: A Long-term Study Of 114 Patients**
   Jason M. Seibly, DO; David G. McLone, MD; Robin Bowman, MD; Avinash L. Mohan, MD (Chicago, IL)

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6. **Preoperative Predictors For Improvement Following Surgical Untethering In Occult Tight Filum Terminale Syndrome**
   Mohammed F. Khan, BA; Andrew J. Fabiano, MD; Curtis J. Rozzelle, MD; Veetai Li, MD (Buffalo, NY)

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7. **Prospective Study Of Isolated Flat Capillary Midline Lumbosacral Hemangiomas As Indicators Of Occult Spinal Dysraphism**
   Nirav J. Patel, MD; Bermans J. Iskandar, MD (Madison, WI)

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8. **Urological Outcome Following Multiple Repeated Spinal Cord Untethering Operations**
   Cormac O. Maher, MD (Ann Arbor, MI); Stuart B. Bauer, MD; Mark R. Proctor, MD; R. Michael Scott, MD (Childrens Hospital Boston, MA)

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9. **Acute Neurologic Deterioration in Previously Asymptomatic Tethered Spinal Cord Patients**
   Jeffrey Pugh, MD, FRCSC; Keith Aronyk, MD, FRCSC; Vivek Mehta, MD, FRCSC (Canada, Edmonton)

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10. **Occult Tethered Cord Syndrome Presenting As Chronic Musculoskeletal Pain In The Pediatric Population**
    Jenny L. Hume, PA-C; Monica C. Wehby, MD (Portland, OR); Daniel J. Kingsbury, MD (Legacy Emanuel Children's Hospital, Portland, OR)

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11. **Infantile Scoliosis: Intraspinal Anomalies And Treatment Options**
    Darric E. Baty, MD; Joshua Pahys, MD; Jahangir Asghar, MD; Amer Samdani, MD (Philadelphia, PA)

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12. **Suboccipital Decompression For Chiari-associated Scoliosis: Risk Factors And Time Course Of Deformity Progression**
    Matthew J. McGirt, MD; Ghazala Datoo, BS; Frank Attenello, MS; April Atiba, BS; Muraya Gathinji, MS; Benjamin Carson, MD; George Jallo, MD (Baltimore, MD)

Scientific Session III: General Interest

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13. **Analysis Of Head Impacts In Pediatric Snowboarders**
    Susan R. Durham, MD; Aaron Buck; Sienna Calabro; Joseph Gwin; Richard Greenwald, PhD (Lebanon, NH)

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14. **Medial Pectoral Nerve To Musculocutaneous Nerve Neurotization For The Treatment Of Brachial Plexus Birth Injuries**
    Charlie Law, MD; John C. Wellons, MD (Birmingham, AL); Paul A. Grabb, MD (Colorado Springs, CO); R. Shane Tubbs, PhD; Jeffrey Pugh, MD; Charlie Wells (Birmingham, AL)

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15. **Chiari Decompression With And Without Duraplasty. Morbidity Versus Recurrence**
    Thomas M. Moriarty, MD, PhD; Rashid M. Janjua, MD; Ian Mutchnick, MD, MS; Karen Moeller, MD (Louisville, KY)

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16. **Cranio-spinal Reduction Of Abnormal Clivo-axial Angle In Children Improves Neuro-behavioural Disorders**
    Stephen Mott, MD (Washington, DC); Alexander Vaccaro, MD (Philadelphia, PA); Patrick Armstrong, BS; Kristi Schmidt, MD; Fraser C. Henderson, MD; Inge Molzahn, BS (Washington, DC)

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17. **Isolated Thoracic Syringomyelia In Children With Chiari I Malformations**
    Todd Hankinson, MD; Christopher Nickel; Richard Anderson, MD; Neil Feldstein, MD; Elizabeth J. Fontana, MD (New York, NY)

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18. **Outcomes After Surgical Exploration Of Birth-related Brachial Plexus Injuries**
    Gregory R. Toczyl, MD; Veda Vedanarayanan, MD; John Lancon, MD (Jackson, MS)

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19. **Cortical Motor Stimulation for Focal Dystonia**
    A. L. Albright, MD (Madison, WI); Elizabeth Tyler-Kabara, MD, PhD (University of Pittsburgh, PA)

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20. **Quantification Of Growth In Functional Neurosurgical Targets In Children.**
    Daniel J. Curry, MD; Eric Vikingstad, PhD; Dianna Bardo, MD (Chicago, IL)

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21. **Comparison Of Child And Parent Perspectives Of Health Outcome In Pediatric Hydrocephalus**
    Iffat Shams, MD, MPH (Canada, Toronto); Daniel McNeely, MD (Canada, Halifax); Douglas Cochrane, MD (Canada, Vancouver); Abhaya V. Kulkarni, MD, PhD (Canada, Toronto)

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22. **Outcome Following Meg "clusterectomy" In Pediatric Patients With Intractable Epilepsy**
Stephanie Holowka; Ayako Ochi, MD; Hiroshi Otsubo, MD; James M. Drake, MSc (Canada, Toronto); Andrew Jea, MD (Houston, TX); James T. Rutka, MD, PhD; O. Carter Snead, MD (Canada, Toronto)

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23. **Failure Of Seizure Control In Patients Undergoing Hemispherectomy For Intractable Seizures**
Sanjiv Bhatia, MD (Miami, FL); Prasanna Jayakar, MD (Miami Childrens Hospital, FL); Glenn Morrison, MD (Miami Childrens Hospital and University of Miami, FL); Ian Miller, MD (Miami Childrens Hospital, FL); John Ragheb, MD, FACS (Miami Childrens Hospital and University of Miami, FL)

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24. **Epilepsy Surgery In Children With Normal MRI Scans: Integrative Strategies Offer Long-term Seizure Relief**
John Ragheb, MD; Glenn Morrison, MD (Miami Childrens Hospital and University of Miami, FL); Michael Duchowny, MD; Trevor Resnick, MD (Miami Childrens Hospital, FL); Prasanna Jayakar, MD, PhD (Miami Childrens Hospital, FL); Sanjiv Bhatia, MD (Miami, FL); Catalina Dunoyer, MD (Miami Childrens Hospital, FL)

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25. **Seizure-freedom And Complication Rates Following Functional Hemispherotomy**
Jeffrey G. Ojemann, MD (Seattle Children's Hospital, WA); T.S. Park, MD (St. Louis Children's Hospital, St. Louis, MO); David D. Limbrick, MD, PhD (St. Louis, MO); Matthew D. Smyth, MD; Prithvi Narayan, MD (St. Louis Children's Hospital, St. Louis, MO)

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26. **Epilepsy Surgery In Infants Under 1 Year Of Age**
Kelly Knupp, MD; Ken Winston, MD; Oszkar Szentirmai, MD; Pramote Laoprasert, MD; Michael H. Handler, MD (Aurora, CO)

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27. **Passive Range of Motion (pRom) fMRI Accurately Localizes the Motor Strip in Children**
Stephanie Einhaus, MD; Frederick A. Boop, MD (Memphis, TN); Fred Laningham, MD (St. Jude Children's Research Hospital Memphis, TN); Robert Ogg, PhD (St. Jude Children's Research Hospital, Memphis, TN); Dave Clarke, MD; James Wheless, MD; Amy McGregor, MD; Fred Perkins, MD (United States, Le Bonheur Children's Hospital, Memphis)

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28. **Selective Motor Fasciculotomy For Focal Upper Limb Spasticity**
Jogi V. Pattisapu, MD; Mark A. Birnbaum, MD; Xiaofeng Zhang, MD; Julie Gaby, MS (Orlando, FL)

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29. **Epilepsy Surgery In Children With Seizures Arising From The Rolandic Cortex**
David D. Limbrick, MD, PhD (St. Louis, MO); Amir Behdad, MD; Matthew D. Smyth, MD (St. Louis Children's Hospital, St. Louis, MO)

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30. **Hemispheric Deafferentation Using Magnetic Resonance Imaging Guidance: An Alternative To Hemispherectomy**
Ann-Christine Duhaime, MD; Richard P. Morse, MD; Greg Holmes, MD (Lebanon, NH)

Scientific Session V: General Interest

3:00 - 3:10 PM

31. **Long Term Clinical Outcome In Children Who Underwent Revascularization Surgery For Moyamoya Disease**
Raphael Guzman, MD; Marco Lee, MD, PhD; Theresa Bell-Stephens, RN; Bill Pickthorn, PhD; Michael Edwards, MD; Gary Steinberg, MD, PhD (Stanford, CA)

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32. **Pediatric Neurosurgical Fellowships: A 15-year Review**
Susan R. Durham, MD; Scott Shipman, MD, MS (Lebanon, NH)

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33. **Fluorescence And Diffuse Reflectance Spectroscopy For Intraoperative Guidance In Pediatric Brain Surgery**
John Ragheb, MD (Miami Childrens Hospital and University of Miami, FL); Sanjiv Bhatia, MD (Miami, FL); David Sandberg, MD; Glenn Morrison, MD (Miami Childrens Hospital and University of Miami, FL); Wei-Chiang Lin, PhD; Sanghoon Oh, PhD; Bradley Fernald, BA (Miami Childrens Hospital and Florida International, FL)

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34. **The Analysis Of A Prospective Non-accidental Trauma (nat) Algorithm In Identifying Victims Of Child Abuse**
Todd Maxson, MD; Joanne Adams, DO; George Edwards, MD; Timothy M. George, MD, FACS; Nicole Higginbotham, RN, MS, NP (Austin, TX)

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35. **Intracranial Fungal Granuloma In Immunocompetent Children: A Ten Year Clinicopathological Study**
Faiz U. Ahmad, MD; Vikas Naik, MBBS, BSc; Aditya Gupta, MD; Ashish Suri, MD; Chitra Sarkar, MD; Ashok Mahapatra, MD; Bhawani S. Sharma, MD (India, New Delhi)

3:50 - 4:00 PM

36. **Quick-brain Magnetic Resonance Imaging For Non-hydrocephalus Indications**
Symeon Missios, MD; Ann-Christine Duhaime, MD; Joseph Pekala, MD; Patricia Quebada, MD; Jorge Forero, RT; Susan R. Durham, MD (Lebanon, NH)

4:00 - 4:10 PM

37. **Incidence And Natural History Of Aneurysms Associated With Arteriovenous Malformations In Children**
Daniel M. Sciubba, MD; Ananth K. Vellimana; Joseph C. Noggle, BS; Graeme F. Woodworth, MD; Phillippe Gauilloud, MD; George I. Jallo, MD (Baltimore, MD)

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38. **Nasal Drainage Of Cerebrospinal Fluid Is Diminished In Hydrocephalic Rat Pups**
Babak Behnam, MD, PhD; Jogi V. Pattisapu, MD; Meenu Madan, PhD; Matthias Rammling, MSc; Leena Paul, MSc (Orlando, FL)

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39. **Distressed Ependymal Cilia Movement In H-tx Hydrocephalic Rat Model**
Meenu Madan, PhD (Orlando, FL); Matthias Rammling, MSc; Leena Paul, MSc; Babak Behnam, MD, PhD; Jogi V. Pattisapu, MD (University of Central Florida, FL)

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41. **A Logistic Regression Model To Predict Early Failure Of Endoscopic Third Ventriculostomy In Children**
Jonathan Roth, MD; Shlomi Constantini, MD (Israel, Tel Aviv); Spyros Sgouros, FRCS (United Kingdom, Birmingham); Conor Mallucci, FRCS (United Kingdom, Liverpool); James M. Drake, MD, FRCS; Abhaya V. Kulkarni, MD, PhD (Canada, Toronto)

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42. **Comparison Of Conversion Rates From Temporary Csf Management To Permanent Shunting In Premature IVH Infants**
John Wellons, MD; Chevis Shannon, MBA; Walter Oakes, MD (Birmingham, AL); William Whitehead, MD (Houston, TX); Tamara Simon, MD; Jay Riva-Cambrin, MD; John Kestle, MD (Salt Lake City, UT)

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43. **Endoscopic Third Ventriculostomy Versus Vp Shunt - A Decision Analysis**
James M. Drake, MD (Canada, Toronto); Abhaya Kulkarni, MD (Canada, Hospital for Sick Children, Toronto); John Kestle, MD (Primary Children's Centre, Salt Lake City, UT)

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44. **The International Infant Hydrocephalus Study: Update Of The On-going Randomized Trial Of Endoscopic Third Ventriculsotomy Versus Shunt For Infant Triventricular Hydrocephalus**
Spyros Sgouros, FRCS (United Kingdom, Birmingham); Shlomi Constantini, MD (Israel, Tel Aviv); Abhaya V. Kulkarni, MD, PhD (Canada, Toronto)

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45. **Medical, Social, And Economic Factors Associated With Health-related Quality Of Life In Canadian Children With Hydrocephalus**
Abhaya V. Kulkarni, MD, PhD (Canada, Toronto); Douglas Cochrane, MD (Canada, Vancouver); Daniel McNeely, MD (Canada, Halifax); Iffat Shams, MD, MPH (Canada, Toronto)

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46. **Impaired Lymphatic Cerebrospinal Fluid Absorption In Experimental Communicating Hydrocephalus**
Gurjit Nagra, BS (Canada, Toronto); Marion L. Walker, MD (Salt Lake City, UT); Michael R. Egnor, MD; Mark Wagshul, PhD (Stony Brook, NY); Jie Li, MD (Detroit, MI); Miles Johnston, PhD (Canada, Toronto); James P. (Pat) McAllister, PhD (Salt Lake City, UT)

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47. **Elevated Cerebrospinal Vascular Endothelial Growth Factor In Hydrocephalus: Therapeutic Implications?**
Judah Folkman, MD; Joon W. Shim, PhD; Joseph R. Madsen, MD; Susan Connors, MA (Boston, MA)

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48. **Emotional Functioning Of Children With Congential Hydrocephalus 10 Years Post Shunting**
Martin Oliveria, PhD; Emily Austria, BS; Scott Hunter, PhD; Maureen A. Lacy, PhD; David Frim, MD, PhD (Chicago, IL)

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49. **Efficacy Of The Bactiseal Catheter In Pediatric Hydrocephalus**
Virginia L. Martinez, PA-C; Jennifer Brock, BS; Yandong Zhou, MS; Holly Gilmer-Hill, MD; Steven D. Ham, DO; James P. (Pat) McAllister, PhD; Sandeep Sood, MD (Detroit, MI)

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50. **Aquaporin-1 And Aquaporin-4 Immunolocalization And Alteration In Hydrocephalic H-tx Rat Brain**
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51. **Vegf-r2+ Activation In The Caudate: An Adaptive Angiogenic Response To Hypoxia In Chronic Hydrocephalus?**
Mark G. Luciano, MD, PhD; Abhishek Deshpande, MD; Stephen M. Dombrowski, PhD (Cleveland, OH)

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52. **Identifying And Treating Patients With Pseudotumor And Cerebral Venous Sinus Thrombosis**
Stephanie L. Einhaus, MD; Michael E. Tobias, MD; Robert A. Sanford, MD; Michael Mulbauer, MD; Frederick A. Boop, MD (Memphis, TN)

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53. **Has The Ventriculoperitoneal Shunt Tap Outlived Its Usefulness**
Steven C. Fulop, MD; Shervin Dashti, MD, PhD; Shenandoah Robinson, MD; Alan R. Cohen, MD; Jonathan P. Miller, MD (Cleveland, OH)

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54. **Endoscopic Third Ventriculostomy, Analysis Of Failure**
Juan Alzate, MD; David H. Hoffman, BA (Bronx, NY); Rick Abbott, MD (Bronx, NY)

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55. **Endoport Neurosurgery: Air Medium Endoscopic Intraventricular Tumor Resection**
Devin V. Amin, MD, PhD; Amin Kassam, MD; Elizabeth Tyler-Kabara, MD, PhD; L. Dade Lunsford, MD (Pittsburgh, PA)

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56. **Neurological Morbidity After Brainstem Tumor Surgery In Children**
Carlo Mazza, MD; Barbara Masotto, MD; Albino Bricolo, MD; Alessandro Segna, MD; Miriam Mulino, MD; Francesco Sala, MD; Paola Lanteri, MD, PhD; Francesco Procaccio, MD (Italy, Verona)

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57. **Retrospective Review of Pediatric Anaplastic Astrocytomas**
Tedi S. Vlahu, BS; Mark D. Krieger, MD; Ira E. Bowen, BA; J. Gordon McComb, MD (Los Angeles, CA)

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58. **Pilocytic/pilomyxoid Astrocytomas: Does Histology Co-relate With Clinical Behavior?**
Deepti Bhargava, MS; Aditya Shivane, MD, FACP; Arundhati Chakraborthy, MD, FACP; Atul Tyagi FRCS; Darach Crimmins, FRCS; Paul Chumas, FRCS, Frederica Novegno, MRCS; Saurabh Odak, MRCS; Paul Roberts, FRCP (Leeds, United Kingdom)

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59. **Phosphodiesterase Type 4 Drives Brain Tumor Growth In Vivo**
Nicole Warrington, BA (St. Louis Children's Hospital, St. Louis, MO); Mahil Rao, BS (Washington University in St. Louis, MO); Jeffrey R. Leonard, MD (St. Louis Children's Hospital, St. Louis, MO); David Piwnica-Worms, MD (Washington University in St. Louis, MO); Joshua B. Rubin, MD, PhD; Mark B. Woerner, BS; Goldhoff Patricia, BS (St. Louis Children's Hospital, St. Louis, MO); David D. Limbrick, MD, PhD (St. Louis, MO); Erin Jackson, BS; Hope Andrew, MD (Washington University in St. Louis)

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60. **The Role Of Intraoperative Arachnoid And Cerebrospinal Fluid Sampling In Children With Posterior Fossa Brain Tumors**
Mark A. Edgar, MD; Jeffrey P. Greenfield, MD, PhD (New York, NY); James T. Rutka, MD, PhD; Laurence E. Becker, MD, PhD (Canada, Toronto); Ira J. Dunkel, MD; Mark M. Souweidane, MD; Peter F. Morgenstern, AB, MS (New York, NY)

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61. **Rathke Cleft Cysts In The Pediatric Population**
Gabriel Zada, MD; J. Gordon McComb, MD; Ira Bowen, BA; Sean McNatt, MD; Mark Krieger, MD (Los Angeles, CA)

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62. Isolation Of Medulloblastoma Stem Cells Using Signaling Pathway Reporters
Michael S. Edwards, MD; Samuel H. Cheshier, MD, PhD; Laurie E. Ailles, PhD; Tal Raveh, PhD; David Cox; Irving L. Weissman, MD (Stanford, CA)

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63. A Stem Cell Based Infiltrative Model Of Pontine Glioma
Mark M. Souweidane, MD (Weill Cornell Medical College, NY); Jeffrey P. Greenfield, MD, PhD (New York, NY); Yanni Karempelas, MD; Eleni Souliopoulos, BS; Daniel Bassiri, BS; Neal Luther, MD; John Boockvar, MD (Weill Cornell Medical College, NY)

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64. Identification Of Specific Inhibitors For Brain Tumor Stem Cells
Ichiro Nakano, MD, MSc (Los Angeles, CA)

Scientific Session VIII: Tumor

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65. A Comparison Of Intracranial And Lumbar CSF Cytology In Staging Pediatric Medulloblastomas And Ependymomas
J. Gordon McComb, MD; Mark D. Krieger, MD; Sergei Terterov, BS; Ira E. Bowen, BA (Los Angeles, CA)

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66. Pre-operative Embolisation In Choroid Plexus Tumours In 12 Children: An Update On A Departmental Experience
Dominic Thompson, FRCS; Richard Hayward, FRCS; Silvia Gatscher, MD (United Kingdom, London)

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67. Stereotactic Radiosurgery in Recurrent Pediatric Ependymomas
Elizabeth M. Trinidad, MD; Arthur Liu, MD, PhD; Laurie Gaspar, MD; Ken Winston, MD; Michael H. Handler, MD; Nicolas Foreman, MB (Denver, CO)

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68. Direct Administration Of Chemotherapy Into The Fourth Ventricle In A Piglet Model
Kyle Padgett, PhD; John W. Kuluz, MD; Manuel Gonzalez-Brito, DO; Juan Solano, MD; Danshe He, MD; John Landrum, PhD; Carol K. Petito, MD; Kenneth Crandall, BS; David I. Sandberg, MD; Darwin Babino, BS (Miami, FL)

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69. Intraoperative Neurophysiological Assessment Of The Motor System In Pediatric Neurosurgery
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70. A Proposed Grading System For Intramedullary Spinal Cord Tumors In Children: Predictive Value For Subsequent Progressive Spinal Deformity
Ali Bydon, MD; George Jallo, MD; Matthew J. McGirt, MD; Timothy Witham, MD; Kaisorn Chaichana, BS (Baltimore, MD); Kevin Yao, MD (Boston, MA); Fred Epstein, MD (New York, NY)

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71. Pediatric Acoustic Neuroma
Ahmad Khaldi, MD; Douglas Anderson, MD (Loyola University Medical Center, IL); Brian P. Walcott, BS (Maywood, IL)

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72. CyberKnife Radiosurgery in Pediatric Patients
Richard D. Bucholz, MD, FACS; Kathy Klebert, RN; Damon Harbison, MBA; Bruce Walz, MD; Ann Marie Flannery (St. Louis, MO)

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73. Acute Endocrine Response Following Severe Traumatic Brain Injury In Children
Srinivas Ravi, BS; Heather Derry; Danielle Brown, MS; Kate Felmet, MD; P. David Adelson, MD (Pittsburgh, PA)

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Scientific Session IX

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74. Laminoplasty Versus Laminectomy Is Associated With A Decreased Incidence Of Spinal Deformity After Resection Of Intramedullary Spinal Cord Tumors In Children
April Atiba, BS (Providence, RI); Kevin Yao, MD (Boston, MA); Fred Epstein, MD (New York, NY); Matthew J. McGirt, MD; Kaisorn Chaichana, BS; Frank Attenello, BS; George Jallo, MD (Baltimore, MD)

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75. Chiari Malformations and Spinal Cord Injuries
Jeffrey W. Campbell, MD, MS (Wilmington, DE)

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76. Cervical Spine Clearance Of Non-communicative Children After Trauma
Jeanne Rubsam, RN (New York, NY); Douglas L. Brockmeyer, MD; Kris Hansen, RN (Salt Lake City, UT); Monique Vanaman, MD (New York, NY); Peter Kan, MD (Salt Lake City, UT); Richard C. E. Anderson, MD (New York, NY); Eric R. Scaife, MD (Salt Lake City, UT)

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77. Intracranial Pressure And Cerebral Perfusion Pressure As Risk Factors In Children With Traumatic Brain Injuries
Antonio Palomeque, MD; Josep Maria Costa, MD; Francisco José Cambra, MD, PhD; Ramon Navarro, MD; Albert Català, MD (Spain, Barcelona)

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78. Treatment Of Pediatric Atlantoaxial Instability With Harms Fusion Constructs
Gregory G. Heuer, MD, PhD; Deb A. Bhowmick, MD; Robert Bailey, BS; Suresh N. Magge, MD; Phillip B. Storm, MD (Philadelphia, PA)

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79. C1 Lateral Mass Screws Incorporated In Occipitocervical And Atlantoaxial Fusions In Children 8 Years Of Age Or Less: A Series Of 6 Patients
Abhaya V. Kulkarni, MD, PhD; James T. Rutka, MD, PhD; Michael D. Taylor, MD, PhD (Canada, Toronto); Andrew Jea, MD (Houston, TX); James M. Drake, MSc; Peter B. Dirks, MD, PhD (Canada, Toronto)

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80. Failed Age-dependent Maturation Of The Occipital Condyle And C1 Superior Articular Surface May Predict Instability In Down Syndrome: Screening Recommendations
Samuel R. Browd, MD, PhD (Seattle, WA); Steele McIntyre, BS; Douglas Brockmeyer, MD (Primary Children's Medical Center, Salt Lake City, UT)

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81. Long-term Outcomes And Prognostic Factors In Pediatric Patients With Severe Traumatic Brain Injury And Elevated Intracranial Pressure
Rod J. Oskouian, MD; Charles A. Sansur, MD; John A. Jane Jr., MD; John A. Jane, MD, PhD; David O. Okonkwo, MD, PhD (Charlottesville, VA); Kwang H. Yeoh, BS (New Zealand, Auckland); Jayant Jagannathan, MD; Aaron S. Dumont, MD (Charlottesville, VA)

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82. Mechanism Of Central Nervous Injury And Repair Through Epigenetic Phenomena And Modulation Of Dna Methyltransferases
Elias Rizk, MD (Harrisburg, PA); Bermans Iskandar, MD (University of Madison Wisconsin, WI); Brenton Meier III, MD (University of Wisconsin Madison, WI); Nithya Hariharan, MD (University of Madison Wisconsin, WI)

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Charles L. Rosen, MD; John R. Orphanos, MD; Jamshed A. Zuberi, MD; James C. Helmkamp, PhD; John J. Collins, MD (Morgantown, WV)

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84. The Effect Of Pulsatile Cerebrospinal Fluid Flow On Astrocytic Growth On Polymer-coated Silicone Catheters
Carolyn A. Black, BS (Salt Lake City, UT); William E. Grever, PhD; N.K. Simon Ng, PhD (Detroit, MI); James Resau, PhD (Grand Rapids, MI); James P. (Pat) McAllister, PhD (Salt Lake City, UT)

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85. Pathogenesis And Treatment Of Intracranial Arachnoid Cysts In Pediatric Patients Younger Than 2 Years Of Age
Gabriel Zada, MD; Mark Krieger, MD; Sean McNatt, MD; Ira Bowen, MD; J. Gordon McComb, MD (Los Angeles, CA)

Scientific Session XI: Hydrocephalus II

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86. Nitrous Oxide Inhibits Neuronal Regeneration In Vitro
Kirk Hogan, MD; Brenton Meier, BS; Bermans Iskandar, MD; Nithya Hariharan, MD (Madison, WI); Elias Rizk, MD (Penn State University, PA)

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87. Expression Of Netrin-4 And Its Receptors After Hypoxic Ischemic Injury To The Neonatal Brain
Jason Liauw, BS; Stanley Hoang, BS; Matt Choi, BS; Mariya Kalashnikova, BS; Alexis Davis, MD; Michael Edwards, MD; Gary Steinberg, MD, PhD; Raphael Guzman, MD (Stanford, CA)

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88. Hyperdynamic Pulsatile Flow And Ventricular Dilation In Experimental Communicating Hydrocephalus
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89. Shunt Disconnection Or Fracture: Treatment Alternatives In Symptomatic And Asymptomatic Patients
Maria Lamberti-Pasculli, RN; James Drake, MB (Canada, The Hospital for Sick Children, Toronto); Kemel A. Ghotme Ghotme, MD (Canada, Toronto); James Rutka, MD, PhD (Canada, The Hospital for Sick Children, Toronto)

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90. Validation Of A Noninvasive Test Of Csf Shunt Function
Sherman C. Stein, MD; Frederick J. Fritz, BS, MBA; Marek Swoboda, PhD; Brian Lind (Philadelphia, PA)

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91. Ventriculo-peritoneal Shunt Infection Rates: Reaching For 0
Eric R. Trumble (Orlando, FL)

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92. Lumboperitoneal Shunting In Children With Ventriculoperitoneal Shunts And Acquired Raised Intracranial Pressure
Christopher A. Gegg, MD; Greg Olavarria, MD; Jogi V. Pattisapu, MD (Orlando, FL)

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93. First Experiences With An Adjustable Gravity-assisted Valve In Childhood Hydrocephalus
Veit Rohde (Germany, Goettingen)

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94. Laparoscopic Placement of Distal Shunts
Brian P. Callahan, MD; Michael H. Handler, MD, FACS (Aurora, CO)

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95. Neuroendoscopic Laser Assisted Cystoventriculostomy And Ventriculocysternostomy Using A Recently Developed 2.0 Micron Fiber Guided Laser In Children With Hydrocephalus
Hans C. Ludwig, MD; Thorsten Knobloch, MD (Germany, Goettingen); Kevin Rostasy, MD (Austria, Innsbruck); Veit Rohde, MD (Germany, Goettingen)

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96. Can Prenatal Mri Predict The Need For Postnatal Ventricular Shunting?
Robert Delapaz, MD (New York City, NY); Peter Kan, MD, MPH (Salt Lake City, UT); Sherelle Laifer-Narin, MD; Neil A. Feldstein, MD; Richard CE Anderson, MD; Monique Vanaman, BA (New York City, NY)

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97. The Cavum Septi Pellucidi: Implications For Endoscopic Surgery Of The Third Ventricle
Mark M. Souweidane, MD; Caitlin E. Hoffman, MD; Theodore H. Schwartz, MD (New York, NY)

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98. Shunt Infections - A Plague Of The Past?
Silvia Gatscher, MD (United Kingdom, London)

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99. Osmolarity Predicts Ventricular Volume In Experimental Hydrocephalus
Satish Krishnamurthy, MD (Detroit, MI); Jie Li; Yimin Shen; James P. McAllister, PhD (Wayne State University, Detroit, MI)

1. **Comparison Of Perceptions And Treatment Practices Between Neurosurgeons And Plastic Surgeons For Infants With Deformational Plagiocephaly**

Andrea Van Pelt, MD; David D. Limbrick, MD, PhD; Albert S. Woo, MD; Alex A. Kane, MD; Matthew D. Smyth, MD; Amy Lee, MD (St. Louis, MO)

Introduction: Deformational plagiocephaly (DP) is the leading cause of head shape abnormalities in infants. Treatment options include conservative measures versus cranial molding. Pediatric neurosurgeons and craniofacial plastic surgeons have yet to agree on an ideal therapy and no definable standards exist for initiating treatment with helmets. Furthermore, there may be differences between specialties in their perceptions of DP severity and need for helmet therapy.

Methods: Requests to participate in a web-based questionnaire were sent to U.S. and Canadian members of the American Board of Pediatric Neurosurgeons and American Cleft Palate & Craniofacial Association. Questions focused on educational background, practice setting, volume of DP patients, preferences for evaluation, treatment and follow-up, and incentives or deterrents to treat with helmet therapy. Six examples of varying degrees of DP were presented to delineate treatment preferences.

Results: Of 772 surveys sent (302 neurosurgeons, 470 plastic surgeons), 77 neurosurgeons (26%) and 64 plastic surgeons (14%) responded. The following responses represented the greatest variations between specialties: (1) 8% neurosurgeons and 27% plastic surgeons strongly agree with the statement that helmet therapy is more beneficial than conservative therapy (significantly different at $p < 0.01$), (2) 25% neurosurgeons and 58% plastic surgeons would treat moderate to severe DP with helmets ($p < 0.01$).

Conclusions: Survey responses support the assumption that neurosurgeons are less likely to prescribe helmet therapy for DP than plastic surgeons. Parents of children with DP are faced with a costly treatment decision that may be influenced more strongly by referral and physician bias than medical evidence.

2. **Craniofacial Reconstruction As Treatment For Increased Intracranial Pressure**

Lissa C. Baird, MD; Allen Ho; Lars Evers; Landon Pryor, MD; Nathalie LeFloch, RN, NP; Hal Meltzer, MD; Steven Cohen, MD; Michael L. Levy, MD, PhD (San Diego, CA)

Introduction: Craniofacial procedures may need to address symptomatic intracranial hypertension. The authors review their institutional experience in the treatment of children with symptomatic increased ICP utilizing craniofacial reconstructive procedures.

Methods: The senior authors' (HM, SRC, MLL) craniofacial surgical experience over a five year period at a single institution (Rady Children's Hospital, San Diego) was reviewed. 17 patients were identified who were felt to be candidates for craniofacial surgery with symptomatic increased ICP.

Results: Patient diagnoses included single-sutural craniosynostosis, craniofacial dysostoses, shunt induced craniostenosis, and shunt associated intracranial hypertension (slit-ventricle syndrome). 14 patients underwent 20 craniofacial procedures. Age at surgery ranged from 3 months to 13 years with a mean of 5 years. Pre-operative symptoms and signs included headaches, unexplained irritability, seizures, papilledema, and visual loss. All patients had diagnostic neuroimaging. Seven patients had pre-operative invasive ICP measurements. Surgery was deferred on three of these patients based on these measurements. Mean total operative (including anesthesic preparation) and surgical times were 3 hours 12 minutes and 2 hours 20 minutes, respectively. Percentage operative blood loss averaged 11.3%. In six procedures no transfusions were required. Average hospital stay was 4 days. There was no perioperative mortality or significant surgery associated morbidity. All patients have had post-operative clinical improvement in signs and symptoms of increased ICP. Our treatment paradigm and operative management scheme is discussed.

Conclusion: Using modern diagnostic and surgical techniques, including invasive ICP monitoring, increased intracranial pressure can be successfully managed by an experienced, multidisciplinary, craniofacial team.

3. **Use And Risk Profile Of Standard (non-fast Resorbing) Macropore Absorbable Plate System In Pediatric Neurosurgery**

Jeffrey Pugh; Sarah Kelley; John Wellons; John Grant; Peter Ray; Jeffrey P. Blount (Birmingham, AL)

Introduction: Rigid fixation of bone is a cornerstone principle for bony healing. Absorbable plate systems are now widely and preferentially utilized in craniofacial and pediatric neurosurgery. Different polymers of polylactide (Pla) and polyglycolid (PGa) result in plate material with different degradation profiles. There has been a recent surge in interest in fast resorbing polymers but little information is available about performance and risk profile in standard (Macropore) longer lasting (6-18 months) plate systems in children. These plate systems might hold appeal in situations where rapid plate break down would not be advantageous. We here review a single surgeon consecutive series with standard plate material.

Methods: Five year retrospective observational review of chart and database of patients undergoing craniotomy for which standard Macropore absorbable plate system was utilized.

Results: Between 2002 and 2007 74 children who underwent craniotomy for a variety of indications (epilepsy 33, tumor 19, trauma 13, vascular 3 and other 6) were closed with Macropore plates. Seven patients (9%) developed palpable hardware and it was painful in 4 patients (5%) necessitating screw removal in two patients (3%). Two patients (3%) developed sterile abscesses requiring hardware removal in one patient. Five patients (7%) demonstrated some settling of the flap but none required revision.

Conclusions: Even long lasting absorbable plate material demonstrates favorable performance with low complications and excellent bone fixation.

4. **Epilepsy As A Comorbidity In A Pediatric Spina Bifida Population**

R. Shane Tubbs; W. Jerry Oakes; Jeffrey Blount; John Wellons; Sarah V. Kelley; Chevis Shannon; Jeffrey Pugh; Leslie Ackapo-Satchivi (Birmingham, AL)

Introduction: Spina Bifida occurs in 7 out of every 10,000 live births in the United States and may have many important co-morbidities that significantly impact learning, independence, self esteem and overall well being. Many such co-morbidities have been characterized but there is relatively little information about epilepsy in SB. The purpose of the study was to examine the impact of spina bifida and epilepsy as comorbidities on our patient population.

Methods: IRB approval obtained. The authors retrospectively reviewed electronic medical records and hospital charts of patients followed in a multidisciplinary, Children's Hospital based spina bifida clinic. Patients found to have one or multiple seizure episodes were included in our study.

Results: Out of the approximately 585 children we follow in our spina bifida clinic only 13 (2%) were found to have noted seizures. Of the 13 patients we reviewed for this study all but 1 had a shunt. Four out of the 13 (31%) reported having only one seizure episode, while the remaining 9 reported multiple episodes. Only 2 (15%) had a VNS with 10 out of the 13 reporting controlled epilepsy with medication. Medication profiles and shunt location are being evaluated as possible confounders for seizure outcomes in this population.

Conclusions: The incidence of epilepsy in Spina Bifida appears to be low. Therefore spells of suspended consciousness with stereotypical movements are more likely to be posturing from shunt failure than a new onset seizure.

5. **Tethered Cord Release: A Long-term Study Of 114 Patients**

Jason M. Seibly, DO; David G. McLone, MD; Robin Bowman, MD; Avinash L. Mohan, MD (Chicago, IL)

Introduction: The second most common cause for decline in a child born with a myelomeningocele is tethering of the distal spinal cord at the site of the original back closure. All children born with an open neural tube defect are managed aggressively at our institution to maintain or improve their neurologic outcome. This report is a review of the indications for symptomatic detethering of the spinal cord, surgical intervention and outcome of the children with myelomeningoceles treated at Children's Memorial Hospital (CMH) since 1975.

Methods: A cohort of 502 children were followed who had their original closure at CMH . Of these, 114 children (23%) have developed a symptomatic tethered spinal cord. Eighty-one patients (71%) have undergone one detethering and 33 patients (29%) have undergone multiple detetherings for a total of 163 total surgical cases. The indicators of symptomatic spinal cord tethering are: scoliosis, decline in lower extremity (LE) motor strength, LE contractures, LE spasticity, gait change, urinary changes and pain. Patients had short and long-term follow up.

Results: Pain has the best response to surgical detethering with 100% of the children improved post-operatively. All other indicators of tethering demonstrate a significant improvement or stabilization in the early post-operative period (3month - 1 year follow up). Long-term follow up (average 12 years, range 1 month - 23.3 years) demonstrates that scoliosis tends to progress with 58% of the cohort eventually requiring a spinal fusion.

Conclusions: Tethered cord release is highly beneficial in maintaining neurologic function in children born with an open neural tube defect.

ORAL ABSTRACTS

6. **Preoperative Predictors For Improvement Following Surgical Untethering In Occult Tight Filum Terminale Syndrome**
Mohammed F. Khan, BA; Andrew J. Fabiano, MD; Curtis J. Rozzelle, MD; Veetai Li, MD (Buffalo, NY)
Introduction: An occult tight filum terminale syndrome, wherein clinical symptoms result from tension on the spinal cord despite non-diagnostic spinal MR imaging, has been described. Recent reports have suggested a role for surgical untethering in this patient population. No consesus exists regarding diagnostic criteria for this entity, however. Due to the various clinical presentations, the relationship of presenting signs and symptoms to post-operative outcomes might be useful in surgical selection.
Methods: Twenty-two patients were retrospectively reviewed who underwent surgical untethering for suspected occult tight filum terminale syndrome. All had non-diagnostic imaging, defined as a conus medullaris above the L3 vertebral body and a filum terminale diameter less than 2 mm. Preoperative symptoms, signs, and urodynamic test results were collected and compared with surgical outcomes determined by office clinic notes and postoperative urodynamics.
Results: Of 22 patients, 10 were female and age ranged from 18 months to 16.5 years. Sixteen (73%) patients experienced subjective and/or objective improvement following untethering. Five of eleven (45%) patients with abnormal preoperative urodynamic testing demonstrated objective improvement postoperatively. Abnormal findings on presentation were categorized as cutaneous, urologic, orthopedic, or neurologic. Patients presenting with abnormal findings in at least two categories were more likely to improve following untethering (88%) than those with abnormalities in only one catgory (20%, p=0.009).
Conclusions: Spinal cord untethering is a treatment option for occult tight filum terminale syndrome. Further evaluation of the relationship between preoperative findings and surgical outcomes may facilitate surgical candidate selection.

7. **Prospective Study Of Isolated Flat Capillary Midline Lumbosacral Hemangiomas As Indicators Of Occult Spinal Dysraphism**
Nirav J. Patel, MD; Bermans J. Iskandar, MD (Madison, WI)
Introduction: It is debated, whether asymptomatic patients who present with isolated, flat, midline, capillary, lumbosacral hemangiomas (fLSH) should be evaluated with magnetic resonance imaging (MRI) to rule out occult spinal dysraphism (OSD).
Method: This is a prospective study under IRB approval. From 2004-2007, every patient referred to the pediatric neurosurgery clinic at the University of Wisconsin for asymptomatic fLSH was evaluated by MRI. The majority of MR imaging was a fast, non-sedated, relatively inexpensive scan (Quick-Spine MRI). Patients with neuro-urological symptoms, orthopedic deformity, or other cutaneous stigmata for OSD including raised hemangioma, were excluded from the study.
Results: Of 57 asymptomatic patients who presented with LSH, 5 (8.7%) had tethering spinal lesions (4 thick/fatty fila; 1 lipomyelomeningocele). Four others (7%) showed isolated syringomyelia. In 2 of these, the syrinx was significantly expanding the cord and was treated surgically. The other 2 syringes were observed with no consequences. Total spinal abnormalities was 15.7%.
Conclusions: The incidence of OSD in asymptomatic patients with isolated, flat, midline, lumbosacral hemangioma is significant. Considering the potential neurological sequelae that can occur from unrepaired tethered cord, we recommend screening in these patients. At our institution, a non-sedated, rapid, relatively inexpensive MRI is preferred.

8. **Urological Outcome Following Multiple Repeated Spinal Cord Untethering Operations**
Cormac O. Maher, MD (Ann Arbor, MI); Stuart B. Bauer, MD; Mark R. Proctor, MD; R. Michael Scott, MD (Childrens Hospital Boston, MA)
Introduction: Patients that have had a prior myelomeningocele or lipomyelomeningocele repair may present with symptomatic retethering of the spinal cord. The expected urological outcome following repeat untethering in a patient after two or more prior untethering operations is not well described.
Methods: We reviewed the records of all children with lipomyelomeningocele or myelomeningocele that underwent at least two untethering procedures after their initial repair and had urodynamic testing within 6 months prior to and following each untethering operation according to the protocol at Children's Hospital Boston. In each case, urological testing included a slow-fill cystometrogram and an external urethral sphincter electromyogram using a concentric needle electrode to analyze individual motor unit action potentials at rest, in response to sacral reflexes, and during bladder filling and emptying.
Results: New urinary symptoms were identified in 7 of 13 cases prior to surgery. Postoperative subjective improvement in urinary symptoms was noted in 5 of 7 cases. The presence of preoperative urinary symptoms correlated with abnormal findings on preoperative urodynamic testing in every case. Three patients presented with worsening preoperative urodynamics alone and two of these improved following surgery. An improvement in bladder function on urodynamic testing correlated with symptomatic improvement. Sphincter EMG findings did not correlate with changes in preoperative symptoms or postoperative improvement.
Conclusions: In patients undergoing multiple repeated spinal cord untethering operations, measurement of bladder function is more useful than sphincter EMG for selecting candidates for surgery and measuring surgical outcomes.

9. **Acute Neurologic Deterioration in Previously Asymptomatic Tethered Spinal Cord Patients**
Jeffrey Pugh, MD, FRCSC; Keith Aronyk, MD, FRCSC; Vivek Mehta, MD, FRCSC (Canada, Edmonton)
Introduction: Fat within the filum terminale represents one of a number of elements that can cause tethering of the spinal cord. Tethered cord syndrome, a collection of clinical symptoms including back pain, radiculopathy, weakness or sensory loss, and voiding difficulties may be due to vascular changes within the distal spinal cord and conus medularis. As such, patients with spinal cord tethering may be at risk for neurologic injury following periods of hypotension or trauma. However, the overall prevalence and natural history of tethered spinal cord is poorly understood and therefore considerable controversy exists regarding the best management of asymptomatic patients.
Methods: A series of four patients presenting with acute neurologic deficits following relatively trivial trauma (2 cases) or cardiac surgery (2) who were discovered to have tethered spinal cord and fat within the filum terminale. All patients went on to have surgical exploration and release of their tethering element.
Results: Lower extremity weakness was the most common finding, followed by radicular pain, back pain, and urinary retention with overflow incontinence. With long-term follow-up of 15 to 58 months we report that patients presenting with back pain, radiculopathy, or weakness have shown complete and often rapid recovery following surgical intervention, whereas those with urinary symptoms and complete paraplegia have a more guarded prognosis.
Conclusions: The best management of asymptomatic tethered spinal cord remains controversial, balancing the risks of prophylactic surgery against the potential for neurologic injury. These cases are presented to add support for the surgical management of identified lesions and consideration for operative intervention prospectively.

10. **Occult Tethered Cord Syndrome Presenting As Chronic Musculoskeletal Pain In The Pediatric Population**
Jenny L. Hume, PA-C; Monica C. Wehby, MD (Portland, OR); Daniel J. Kingsbury, MD (Legacy Emanuel Children's Hospital, Portland, OR)
Introduction: Chronic musculoskeletal pain involving the back, neck, and extremities in pediatrics often prompts numerous diagnostic studies and subspecialty consultations without establishing an etiology. In a subset of patients, we have found occult tethered cord syndrome (OTCS) to be a contributing factor. In this retrospective study, we report outcomes following surgery.
Methods: Patients presented to pediatric rheumatology and were referred for neurosurgical consultation when OTCS was suspected. From 2001 to 2005, 40 patients underwent OTCS surgery for the primary symptom of musculoskeletal pain. Patients received two, identical 15 item questionnaires (pre-and postoperative) rating the severity of their symptoms. Primary outcome measures included lumbosacral pain, mid-upper back/shoulder pain, lower extremity pain, cervicalgia, and upper extremity pain. Secondary outcome measures included headache, dysesthesia, bowel and bladder dysfunction, poor sleep, gait problems, and pain with sitting. Quality of life measurements included school absence, affected sports/activities, and medication needs. An overall global severity score was included.
Results: Of the 40 patients, three were lost to followup. Thirty-five (95%) completed questionnaires, on average 15.8 months after surgery (range 3 - 54.5 months). Average age at presentation was 11.8 yr (range 2.3 - 16.7 yr), with 13 males and 22 females. Improvement in primary, secondary, and quality of life outcome measures achieved statistical significance, t test $p < 0.01$. Global severity scores showed improvement was > 75% in 16 patients (46%); 50-74% in 13 (37%); 25-49% in 4 (11%); <24% in 2 (6%).
Conclusions: Surgery for OTCS results in improvement in a subset of pediatric patients presenting with musculoskeletal pain.

11. Infantile Scoliosis: Intraspinal Anomalies And Treatment Options

Darric E. Baty, MD; Joshua Pahys, MD; Jahangir Asghar, MD; Amer Samdani, MD (Philadelphia, PA)

Introduction: Severe scoliosis is a significant health concern at any age, but unique characteristics of infants make safe and effective treatment even more challenging than for other age groups. There is currently a paucity of data on intraspinal anomalies seen in these patients. The current treatment modalities include conservative options such as bracing and casting, as well as operative interventions like intervertebral body stapling and vertical expandable prosthetic titanium rib (VEPTR) placement.

Methods: We retrospectively reviewed the charts of infants undergoing treatment for scoliosis at Shriner's Hospital for Children. The inclusion criteria were patients three years of age or younger with idiopathic scoliosis. All patients underwent preoperative magnetic resonance imaging (MRI) scans. The charts were reviewed for age, sex, major curve Cobb angle, MRI report, and treatment.

Results: Thirty-five patients meeting the inclusion criteria were identified, including 20 males and 15 females (male to female ratio of 1.3:1). The average age at diagnosis was 18.5 months, and the range was 6-36 months. The mean Cobb angle was 38°, ranging from 25°-80°. Six patients (17%) had abnormal MRI scans, and four of these (66%) required neurosurgical intervention.

Conclusions: The relatively high percentage of patients with intraspinal anomalies in this patient population, and the likelihood that most of the patients with abnormalities will require a neurosurgical procedure, lead us to support the routine acquisition of MRI scans for all patients with infantile idiopathic scoliosis. The treatment options include bracing, casting, stapling, and VEPTR. Further study will delineate the benefits of each of these modalities.

12. Suboccipital Decompression For Chiari-associated Scoliosis: Risk Factors And Time Course Of Deformity Progression

Matthew J. McGirt, MD; Ghazala Datoo, BS; Frank Attenello, MS; April Atiba, BS; Muraya Gathinji, MS; Benjamin Carson, MD; George Jallo, MD (Baltimore, MD)

Introduction: Chiari I malformation is often associated with scoliosis. It remains unclear which sub-groups of patients are most likely to experience resolution or progression of their spinal deformity after cervico-medullary decompression. We set out to determine the time frame of curve progression and assess which patient sub-groups are at greatest risk for progression of spinal deformity post-operatively.

Methods: We followed 22 consecutive patients uindergoing cervico-medullary decompression for chiari-associated scoliosis postoperatively with serial standing x-rays for a mean of 42 months to determine the time course and predictors of curve progression.

Results: Eight(36%) patients experience improvement in scoliosis curvature. 11(50%) experienced progression of their scoliosis curvature. In these, progression of deformity occured within 24-months of surgery in all cases (8 by 12 months, 3 by 24 months). Patients with hindbrain headaches in addition to their scoliosis were 5-fold more likely to experience improvement in curvature compared to patients with tonsilar ectopia and scoliosis alone [Odds Ratio(95%CI);4.9(1.2-20.4),p=0.03]. Duration of scoliosis greater than two years(p=0.02), Cobb angle greater than 35 degrees (p=0.01), and scoliosis crossing the thoraco-lumbar junction(p=0.04) were associated with an 8-fold, 16-fold, and 5-fold increase in the likelihood of curve progression.

Conclusions: Over one-third of patients with Chiari-associated scoliosis will improve after cervico-medullary decompression alone. Therefore, cervico-medullary decompression is a good first line option paticularly in children with concordant posterior-fossa symptoms. Patients presenting with more severe scoliosis (>35degrees), crossing the thoraco-lumbar junction, and with longer duration of scoliosis may benefit from earlier orthopedic involvement and should be monitored regularly after cervico-medullary decompression.

13. Analysis Of Head Impacts In Pediatric Snowboarders

Susan R. Durham, MD; Aaron Buck; Sienna Calabro; Joseph Gwin; Richard Greenwald, PhD (Lebanon, NH)

Introduction: Traumatic brain injury is the leading cause of injury-related death among skiers and snowboarders. Head injury rates have been shown to be 3 to 6 times higher for snowboarders than skiers, particularly in children. The majority of head injuries in snowboarders are caused by falls, rather than collisions. The impact forces during snowboarding falls have never been studied.

Methods: 10 Giro® snowboard helmets were fitted with the Head Injury Telemetry System™ containing six head-mounted accelerometers recording linear and rotational acceleration, impact location and cumulative impact history. These were distributed to volunteer participants at a local mountain resort during the 2006-2007 season. Data was collected from each subject during recreational snowboarding activities.

Results: 18 participants ranging in age from 9 to 21 years were studied. There were 15 males and 3 females. 357 valid head impacts were recorded. 25 impacts correlated with user-reported falls. Peak linear acceleration showed a skewed distribution with 84% of impacts less than 30g. 50% of all impacts greater than 52g were frontal. There was a significant effect of skill level and gender on linear acceleration with increased impact severity among males and riders of intermediate and advanced skill levels ($p < 0.05$).

Conclusions: This report is the first biomechanical study of head impact forces as a result of falls while snowboarding. Youth snowboarders, particularly males, sustain severe head impacts (50+ g) while snowboarding that are comparable to impacts sustained by collegiate football players. This data supports the use of protective head gear while participating in snowboarding activities.

14. Medial Pectoral Nerve To Musculocutaneous Nerve Neurotization For The Treatment Of Brachial Plexus Birth Injuries

Charlie Law, MD; John C. Wellons, MD (Birmingham, AL); Paul A. Grabb, MD (Colorado Springs, CO); R. Shane Tubbs, PhD; Jeffrey Pugh, MD; Charlie Wells (Birmingham, AL)

Introduction: Medial pectoral nerve (MPN) to musculocutaneous nerve (MCN) neurotization for biceps reinnervation is a valid option following traumatic injury to the brachial plexus. A major critique of the technique in infants is the smaller size of the MPN and therefore mismatch of viable axons. We describe our institutional experience utilizing the procedure and critically examine the functional outcomes.

Methods: Office charts and hospital records from the Children's Hospital of Alabama were reviewed from 1997 to 2006. Of the 49 patients undergoing brachial plexus exploration for traumatic injury of any nature, 15 underwent MPN to MCN neurotization as a part of an overall procedure to treat birth injury and had at least 9 months follow up. MPN to MCN neurotization was chosen if the clinical exam and intraoperative electrophysiological evidence was consistent with medial cord function. Functional biceps recovery was defined as the ability of the child to bring the hand to the mouth.

Results: Eleven patients (73%) gained functional biceps recovery. The median age of surgery was 6 months (range: 5-9 months). Median follow up was 16 months (range: 11 months to 7 years). Preoperative hand function predicted functional biceps recovery.

Conclusions: MPN to MCN is a valid surgical option in the reinnervation of the biceps muscle following brachial plexus birth injury when the hand is functional preoperatively. Useful arm function can be provided to most of these children.

15. Chiari Decompression With And Without Duraplasty. Morbidity Versus Recurrence

Thomas M. Moriarty, MD, PhD; Rashid M. Janjua, MD; Ian Mutchnick, MD, MS; Karen Moeller, MD (Louisville, KY)

Introduction: The optimal surgical management of Chiari malformations is evolving. Evidence continues to accrue that supports decompression without duraplasty as an effective treatment to achieve symptomatic relief and anatomical decompression. The risks and benefits of this less invasive operation need to be weighed against decompression with duraplasty.

Methods: A retrospective review was performed of all Chiari decompressions from 2003 to 2007. All operations were performed by a single surgeon at a single institution. Data was analyzed for outcome, post-operative morbidity and recurrence.

Results: 102 patients were decompressed of which 46 with and 56 without duraplasty. Patients without duraplasty had a significantly lower hospital stay and morbidity than those with duraplasty. Five patients (11%) who did not have a duraplasty needed re-operation with a duraplasty. These patients were found to have a deep falx cerebelli upon exploration and a low 4th ventricle on MRI. All patients with a syrinx underwent duraplasty and post-operatively had radiographic resolution. All patients, with duraplasty had complete or near complete resolution of symptoms. There were no infections or CSF leaks in either group.

Conclusions: Despite a higher recurrence rate, Chiari decompression without duraplasty may be a good initial surgical option due to the lower morbidity. This lower morbidity in the pediatric population justifies the risk of a higher recurrence rate. Pre-operative radiographic identification of a dense falx cerebelli may further lower the recurrence rate.

ORAL ABSTRACTS

16. Cranio-spinal Reduction Of Abnormal Clivo-axial Angle In Children Improves Neuro-behavioural Disorders

Stephen Mott, MD (Washington, DC); Alexander Vaccaro, MD (Philadelphia, PA); Patrick Armstrong, BS; Kristi Schmidt, MD; Fraser C. Henderson, MD; Inge Molzahn, BS (Washington, DC)

Introduction: Encephalomyelopathy and concomitant neurobehavioral changes may result from neuraxial deformity in the setting of various forms of basilar invagination or Chiari Malformation1. Deformity induced neuraxial stresses may be reduced with open-reduction, fusion and stabilization of the craniocervical junction. 2,3,4 We sought to estimate craniocervical stresses with finite element analysis and correlate them with clinical parameters.

Methods: Nine children with neurological deficits attributed to neuraxial deformity were referred by pediatric neurology and entered prospectively into this IRB approved study. Most manifested behavioral disorders, sleep apnea or gastroesophageal disorder. Standardized outcome instruments were used. The authors introduce a Brainstem Disability Index, collating symptoms referable to brainstem dysfunction. Patients underwent open reduction to correct abnormal clivo-axial angulation, stabilization and fusion .Finite element modeling of brainstem and spinal cord (SCOSIA™) correlated predicted neuraxial stress patterns with pre- and postoperative clinical findings.

Results: Patients were followed for 9-36 months. There were no complications. One patient developed headaches at 6 months. One-tail matched pairs T-test pre- and post-operatively yielded improvements in Visual Analog Pain scale (p.01); ASIA (p.015); SF12 PCS score (p .012)Karnofsky (p.008) and Brainstem Disability Index, ($p<.001$). Finite element analyses were concordant with clinical data ($p<.01$). 8/9 patients and families would recommend the surgery to others; one patient showed no long term improvement.

Conclusions: This study confirms the findings of others 1,2,3,4 that brainstem deformity resulting in neurological changes and abnormal behavior is corrected with open reduction, fusion-stabilization.. Finite element computations of neuraxial stresses were generally concordant with clinical findings.

17. Isolated Thoracic Syringomyelia In Children With Chiari I Malformations

Todd Hankinson, MD; Christopher Nickel; Richard Anderson, MD; Neil Feldstein, MD; Elizabeth J. Fontana, MD (New York, NY)

Introduction: Chiari I malformation is associated with syringomyelia in 10-20% of cases. Cervical spine MRI to evaluate for the presence of syringomyelia is often a component of the initial work-up. In many centers, however, thoracic MRI is not included unless a cervical syrinx is seen. The purpose of this study was to determine the frequency of isolated thoracic syringomyelia and to establish if any clinical findings were associated with this diagnosis.

Methods: A retrospective review of 141 cases of Chiari I malformation treated at Columbia University Medical Center from 1998-2007 was conducted. We first identified all patients who presented with isolated thoracic syringomyelia. Clinical and radiographic findings were then compared with other children in our Chiari I database to determine if any consistent clinical findings were present.

Results: Of 141 children surgically treated for Chiari I malformation, nine were found to have an isolated thoracic syrinx. Although no uniform symptom could be identified in these patients, the majority of children with an isolated thoracic syrinx had sensory deficits.

Conclusions: Isolated thoracic syringomyelia is an uncommon but clinically significant finding in children with Chiari I malformation. The presence of syringomyelia may influence the surgeon's decision to treat and will be missed in patients who do not undergo complete spinal cord imaging. We recommend MRI of the entire spinal cord for all patients undergoing evaluation of Chiari I malformation.

18. Outcomes After Surgical Exploration Of Birth-related Brachial Plexus Injuries

Gregory R. Toczyl, MD; Veda Vedanarayanan, MD; John Lancon, MD (Jackson, MS)

Introduction: Incidence of birth-related brachial plexus (BRBP) injury ranges from 5-25 per 100 live births. Clinical examination and electrodiagnostic studies are still used in select patients for exploration/repair. We report our experience in the treatment of a cohort of children with BRBP injury.

Methods: Eighty-four babies were evaluated for BRBP injury between July 1999 and June 2004. Eighteen patients without improvement, underwent surgical exploration. Recovery of function was measured by clinical examination, Mallet scores, and electrophysiological exam. Median follow-up was 7-12 months.

Results: Five patients were operated at 3-4 months, 4 patients at 5-8 months, and 5 patients at 9-12 months. Erb's point neuroma was the most frequent finding. One baby had complete avulsion of C6 root. Conduction across neuroma was demonstrated in 7 patients (external/internal neurolysis). Remainder with minimal/no conduction across the neuroma (neurolysis/transposition of C3 and/or C4 roots). Improvement in function was seen in 10 of 14 children followed more than 7 months post-operatively. Elbow flexion/shoulder abduction against gravity was seen in all patients. Four out of 14 children showed no elbow flexion, 3 of which had severe axonal injury to all trunks. Post-operative EMG studies demonstrated improved innervation of biceps/deltoid in all patients.

Conclusions: In our cohort, electrodiagnostic studies with clinical examination, is useful in identifying patients for surgery. The prognosis for functional recovery is poor with extensive injury. Improvement in electrodiagnositic studies is better than clinical recovery, and suggests the role of learning to use the limb at a critical stage in development plays a role in functional recovery.

19. Cortical Motor Stimulation for Focal Dystonia

A. L. Albright, MD (Madison, WI); Elizabeth Tyler-Kabara, MD, PhD (University of Pittsburgh, PA)

Introduction: Epidural motor cortical stimulation (EMCS) has been reported to treat adults with focal dystonia associated with thalamic pain. We have used EMCS in three young adults, two 18 year olds and one 22 year old, with severe focal secondary dystonia.

Methods: Epidural strip electrodes were inserted using frameless stereotaxy over the motor cortex innervating the contralateral upper extremity and were connected to implanted pulse generators. Stimulation was continual, with voltages of 2-5 volts, during followup of 0.5-3.5 years. Placement of the electrodes was improved a small craniotomy and by intraoperative monitoring of SSEPs and intraoperative cortical stimulation.

Results: Dystonia improved by 25-35% in each subject and speech improved appreciably in one. Function improved subjectively in all subjects but was not dramatically improved in any. There were no intraoperative or postoperative complications.

Conclusions: EMCS appears to improve severe focal secondary dystonia affecting the upper extremity, and to have low risks. Additional investigation is needed to clarify its effectivenss and optimal stimulation parameters, and to compare it to deep brain stimulation.

20. Quantification Of Growth In Functional Neurosurgical Targets In Children.

Daniel J. Curry, MD; Eric Vikingstad, PhD; Dianna Bardo, MD (Chicago, IL)

Introduction: Deep Brain Stimulation (DBS) in children has been hampered by the unknown effect of growth on the distance from the skull to the target of stimulation. For DBS to be performed in children, a quantification of the effect of growth on the distance from the stereotactic target to the electrode anchor site requires elucidation.

Methods: Brain MRIs for children from 0-16 years were studied from a single institution from 2001 to present. The distance from the ventral posterior Globus Pallidus Internus to a coronal burr hole, the standard location of DBS anchorage, was made. The extent of growth of this vector was then calculated as it related to age.

Results: The vector from the coronal burr hole to the target varied from patient to patient and from age to age. The maximum growth of this distance was from 1 week to 1 year of age, where the vector grew from average 40 mm to 60 mm. After one year of age, the vector grew from average 60 to 72 mm.

Conclusions: Dynamic DBS on the growing brain is possible with a standard, four-contact electrode by placing the most proximal contact at the target and allowing centrifugal growth to pass the four contacts through the target over time while the stimulation field is reprogrammed. Since the four DBS electrode contacts are 10.5mm in total length, this technique is theoretically possible in children older than 1 year, but will require an electrode span of 30mm to accommodate children less than 1 year of age.

21. Comparison Of Child And Parent Perspectives Of Health Outcome In Pediatric Hydrocephalus

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Introduction: A child's perspective on their own health outcome is

important and unique. We assessed the scientific properties of a child-completed version of the Hydrocephalus Outcome Questionnaire (cHOQ) and compared child and parent perspectives of outcome in a large group of older, higher-functioning children with hydrocephalus.
Methods: All cognitively-capable children with previously treated hydrocephalus and between 5 and 19 years old attending the neurosurgery out-patient clinic at three pediatric hospitals were asked to participate. The parents completed the parent HOQ and the Health Utilities Index, while the child completed the cHOQ. A subset of the children were also asked to complete the cHOQ again, approximately 2 weeks later.
Results: A total of 273 children participated (mean age 14.1 years). Their mean cHOQ Overall Health score was 0.78 (on a scale of 0=worst health to 1.0=best health). The reliability of the cHOQ was very good (internal consistency=0.92, test-retest reliability=0.87 (95% CI 0.79-0.92)). Mother-child agreement and father-child agreement were 0.57 and 0.62, respectively. Agreement was higher for assessments of physical health, but lower for assessments of cognitive health and social-emotional health. There was greater parent-child agreement for older children. When there was disagreement, it seemed that children tended to rate their health better than their parents did.
Conclusions: In a large group of older children with hydrocephalus, the cHOQ appears to be a scientifically reliable means of assessing long-term outcome. The differences in child and parent perception of health need to be appreciated when conducting outcome studies in this population.

22. Outcome Following Meg "clusterectomy" In Pediatric Patients With Intractable Epilepsy

Stephanie Holowka; Ayako Ochi, MD; Hiroshi Otsubo, MD; James M. Drake, MSc (Canada, Toronto); Andrew Jea, MD (Houston, TX); James T. Rutka, MD, PhD; O Carter Snead, MD (Canada, Toronto)
Introduction: This study was undertaken to describe the clinical and radiographic features of children with intractable epilepsy in an operative series and in whom resections of magnetoencephalogram (MEG) spike clusters were performed.
Methods: We reviewed the clinical and radiographic records of all patients with intractable epilepsy who underwent clusterectomy by the senior author (JTR) from January 1, 2001 to December 31, 2006.
Results: Fifty-six patients with intractable epilepsy, who underwent clusterectomy as initial surgery or repeat surgery, were identified. Our series consisted of 27 males and 29 females. The average age at presentation for surgery was 11.1 years (range 7 months - 17 years). The most common seizure types seen in our series included complex partial and generalized tonic-clonic. MEG demonstrated 42 patients with large clusters targeted for resection and 14 patients with small clusters targeted for resection. Thirty-four patients underwent near-total clusterectomy; 21 patients underwent subtotal clusterectomy; and one patient had only a partial clusterectomy. Late clinical follow-up was performed by a neurologist in the Epilepsy Clinic with an average of 36.1 months (range 5 - 70 months). Follow-up showed excellent seizure control in patients with a near-total excision of their MEG spike cluster (67.6% seizure-free; 91.2% improved seizure control), whereas subtotal clusterectomy yielded more modest results (52.4% seizure-free; 76.2% improved seizure control). There was no operative mortality in our series; though, 17 patients experienced significant morbidity because of cortical resections in he Rolandic area.
Conclusions: The extent of clusterectomy appears to correlate positively with the surgical outcome, measured as seizure control.

23. Failure Of Seizure Control In Patients Undergoing Hemispherectomy For Intractable Seizures

Sanjiv Bhatia, MD (Miami, FL); Prasanna Jayakar, MD (Miami Childrens Hospital, FL); Glenn Morrison, MD (Miami Childrens Hospital and University of Miami, FL); Ian Miller, MD (Miami Childrens Hospital, FL); John Ragheb, MD, FACS (Miami Childrens Hospital and University of Miami, FL)
Introduction: Failure of seizure control in patients undergoing hemispherectomy for intractable seizures. Acute postoperative seizures in the immediate and early postoperative period are not infrequent. However, long term inadequate seizure control following hemispherectomy for lateralized hemispheric seizure activity is infrequent. We investigated the causes of failure to obtain good seizure control in our patient population.
Methods: A retrospective analysis of the epilepsy surgery database was performed to investigate the causes of inadequate seizure control following hemispherectomy. We then analyzed the preoperative interictal and ictal electroencephalographic data to assess the extent of seizure abnormality. Particular attention was paid to the presence of contralateral abnormalities. Preoperative and postoperative magnetic resonance images were reevaluated to assess the presence of contralateral structural abnormalities and the degree of interhemispheric disconnection.
Results: Since 1979, more than 600 children underwent surgery for intractable epilepsy. Eight-two patients underwent hemispherectomy. Inadequate seizure control was possible in 12 patients. We found incomplete interhemispheric disconnection as seen on postoperative MR scans in 3 patients. Contralateral epileptiform activity was present in 6 patients. A detailed analysis of the results will be discussed.
Conclusions: Unsuccessful control of seizures following hemispherectomy may be secondary to incomplete hemispheric disconnection, contralateral morphological abnormality and multifocal epileptiform abnormalities and postoperative injury to the contralateral hemisphere

24. Epilepsy Surgery In Children With Normal Mri Scans: Integrative Strategies Offer Long-term Seizure Relief

John Ragheb, MD; Glenn Morrison, MD (Miami Childrens Hospital and University of Miami, FL); Michael Duchowny, MD; Trevor Resnick, MD (Miami Childrens Hospital, FL); Prasanna Jayakar, MD, PhD (Miami Childrens Hospital, FL); Sanjiv Bhatia, MD (Miami, FL); Catalina Dunoyer, MD (Miami Childrens Hospital, FL)
Introduction: Surgery for intractable lesional epilepsy has a good prognosis but the outcome for children without a focal lesion on MRI is less clear. We report the outcome of children with non-lesional intractable partial epilepsy undergoing resective surgery.
Methods: We studied 102 children with non-lesional intractable partial epilepsy who underwent excisional surgery. The epileptogenic region was identified by integrating clinical exam and video-EEG data complemented by ictal SPECT (n=40), PET (n=10), extraoperative subdural monitoring (n=80), and electrocorticography (n=22). All patients had follow-up greater than two years, 76 patients had five year follow-up and 43 patients had ten year follow-up.
Results: 66 resections were unilobar, 36 were multilobar. One patient died of cause unrelated to seizures or surgery. At two year follow-up, 44/101 patients were seizure-free, 15 experienced >90% reduction, 17 had > 50% reduction, and 25 were unchanged. At five year follow up, 35/76 patients were seizure-free, 12 experienced >90% reduction, 12 had > 50% reduction, and 17 were unchanged. At ten year follow up, 16/43 patients were seizure-free, 13 experienced >90% reduction, 7 had > 50% reduction, and 7 were unchanged. Outcomes correlated with the presence of convergent focal interictal spikes [p<.005] on the scalp EEG and completeness of resection [p<.0005].
Conclusions: Our findings demonstrate that excisional surgery is successful in the majority of children with non-lesional partial epilepsy. A multimodal approach can minimize the size of resection and alleviate the need for invasive EEG monitoring. Focal interictal spikes and completeness of resection predict good long lasting outcome.

25. Seizure-freedom And Complication Rates Following Functional Hemispherotomy

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Introduction: Functional hemispherotomy is performed in hemiparetic patients with intractable epilepsy arising from one hemisphere. Published seizure-freedom rates following this procedure vary significantly, ranging from 50-90%. In this study, we present our experience with hemispherotomy using two different.surgical techniques.
Methods: Thirty-nine patients aged 0.3 to 20.5 years underwent hemispherotomy by 3 surgeons at a single institution. The first 14 cases were traditional functional hemispherotomies (including temporal lobectomy), while the latter 25 were performed using a peri-insular technique initiated in 2003.
Results: Twenty-four (61.5%) patients were male, and 15 (38.5%) were female. Etiologies included cerebral infarct: 11 patients (28.2%); hemimegalencephaly: 6 (15.4%); cortical dysplasia: 5 (12.8%); Sturge-Weber: 4 (10.3%); Rasmussen's encephalitis: 3 (7.7%); post-traumatic: 3 (7.7%). Thirty-one of the 39 patients (79.5%) were seizure-free at the termination of the study (median follow-up 18 months). Of those 9 patients who were not seizure-free, all had significant improvement in seizure frequency, with six patients achieving Engel class II outcome and 3 achieving Engel class III. Complications were observed in 5 cases (12.8%) and included

hydrocephalus or subdural hygroma requiring shunting in 3 patients (7.7%), wound infection (1 patient), aseptic meningitis (1 patient). There was no difference between the two surgical techniques in terms of rate of seizure freedom ($p = 0.89$) or complications ($p = 0.86$).
Conclusions: Hemispherotomy resulted in seizure-freedom in almost 80% of patients. Seizure recurrence after hemispherotomy was attributable to contralateral onset, not incomplete disconnection. Complications were uncommon and easily managed. There was no difference between surgical techniques in terms of efficacy or complication rates.

26. Epilepsy Surgery In Infants Under 1 Year Of Age
Kelly Knupp, MD; Ken Winston, MD; Oszkar Szentirmai, MD; Pramote Laoprasert, MD; Michael H. Handler, MD (Aurora, CO)
Introduction: Infants with epilepsy may have a catastrophic course. Historically, there has been a reluctance to operate in the very young, though experience is accumulating that persistent early seizures are detrimental. We report our 5 year experience of epilepsy surgery in infants under 1 year of age.
Methods: Retrospective analysis of operations for epilepsy at our institution between 2002 and 2007 identified infants, and assessed persistence of seizures, neurologic deficits and continuing use of anticonvulsants.
Results: 13 infants underwent operations, with an age range of 18 days to 10 months. Most had evidence of focal dysplasias or hemimegalencephaly, and one had tuberous sclerosis. 5 patients underwent hemispherectomy, 7 underwent subdural electrode placement followed by tailored resection, and one patient had resection of a large cortical tuber and subsequently a hemispherectomy. 9 patients are entirely seizure free, 2 have had a single seizure post operatively and 2 have fewer seizures than pre-op. 3 patients take no anticonvulsants, 7 take a single medication, and 3 patients take two or three, at doses reduced from pre-op levels. Hemispherectomy led to the predicted hemiparesis. One patient who had become weak before resection of a motor strip area of dysplasia, remained so. One patient developed infection, 1 a subdural hematoma, and 2 required ventriculoperitoneal shunting. 1 patient had bleeding during hemispherectomy that required a two-stage procedure.
Conclusions: Early aggressive seizure surgery in infants is safe and effective. Properly selected patients with catastrophic epilepsy or focality will benefit considerably from the early intervention.

27. Passive Range of Motion (pROM) fMRI Accurately Localizes the Motor Strip in Children
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Introduction: Extra-operative motor mapping in children has, in the past, been relegated to grid mapping, which can only be performed in cooperative children. Neurophysiological data from animals would suggest overlap of sensory and motor cortices, which should allow passive range of motion to localize the sensorimotor strip.
Methods: The authors report a series of 12 children studied prospectively in which passive range of motion (pROM) was performed under sedation at the time of functional MRI (fMRI). In each instance the motor hand and motor leg region could be accurately localized. In four instances, intra-operative motor evoked potentials or somatosensory evoked potentials were used to confirm the fMRI findings.
Results: All children subsequently underwent resection of either neoplastic or epileptogenic cortex. By avoiding the functional areas denoted by pROM, no unanticipated motor deficits were incurred. Intra-operative mapping confirmed the accuracy of the fMRI finding.
Conclusions: Passive ROM fMRI can be safely performed in young children under sedation to accurately and non-invasively map sensorimotor cortex. This data can be used to avoid functional motor and sensory areas during resective surgery and can avoid the need for awake cortical stimulation studies. The authors will present their technique and lessons learned.

28. Selective Motor Fasciculotomy For Focal Upper Limb Spasticity
Jogi V. Pattisapu, MD; Mark A. Birnbaum, MD; Xiaofeng Zhang, MD; Julie Gaby, MS (Orlando, FL)
Introduction: Background: Focal spasticity is often a limiting factor in rehabilitation of patients. Children who benefit from repeat Botox injections for focal hypertonia can achieve more permanent relief of spasticity without loss of useful muscle tone or sensation.
Methods: We performed selective motor fasciculotomy (SMF) on 15 peripheral nerves (10 median, 5 musculocutaneous) in 9 pts (ages 13-20 yrs) after initial improvement following Botox injections. Pre-operative orthopedic and neurologic evaluations, and occupational assessments using Ashworth and Tardieu scales were obtained. The outpatient surgical procedure was performed under general anesthesia, often combined with other orthopedic interventions for soft tissue releases. The nerve was separated into 6-9 fascicles, and evaluated using intra-operative electromyography (EMG) with stimulation at 2-4 milliamperes current for 0.1 milliseconds. Abnormal response was noted by direct observation of tetanic contraction, and large compound motor action potentials on EMG. Approximately 35-50% of the median or musculocutaneous nerves were divided, and the patients received post-operative occupational therapy, with periodic evaluations for changes in range of motion, resting tone, and functional improvement.
Results: By 6 months, all but one patient had significant improvement in passive flexibility of the elbow, wrist, or fingers. One patient with severe contractures did not improve, and none experienced sensory loss, painful neuroma formation, or other complications. Functional improvement (coordinated grip, feeding or self help skills) was noted in 4 individuals, typically 3 months after the operation (5-16 months followup).
Conclusions: This preliminary report suggests that selective motor fasciculotomy offers long-term benefit to properly selected individuals with focal spasticity of the upper limb.

29. Epilepsy Surgery In Children With Seizures Arising From The Rolandic Cortex
David D. Limbrick, MD, PhD (St. Louis, MO); Amir Behdad, MD; Matthew D. Smyth, MD (St. Louis Children's Hospital, St. Louis, MO)
Introduction: Medically-intractable seizures arising from the sensorimotor (Rolandic) cortex present a formidable challenge for epilepsy surgeons. In order to minimize the morbidity of surgery in this critical area, limited resections and lesionectomies, awake craniotomies, and multiple subpial transections (MST) have been advocated.
Methods: We retrospectively reviewed charts of 23 children (5 male, 18 female) who underwent surgical management seizures arising from Rolandic cortex between 1991 and 2006.
Results: Patient age at the time of surgery ranged from 1.9 -19.2 years (mean: 11.5 years). Length of time from diagnosis of epilepsy to surgery varied from 1 to 13 years (mean: 6.8 yrs). Mean pre-operative seizure frequency was 23 + 30/week. The average postoperative follow-up period was 2.7 years. Three patients had well-defined lesions on MRI correlating with noninvasive EEG and underwent single-stage procedures. Twenty patients underwent invasive monitoring, with 2 families declining further surgery after the seizure focus mapped to motor cortex. Surgical strategies included motor cortex lesionectomy (n=5), motor corticectomy (n=7), motor cortex MST (n=7), and sensory corticectomy or lesionectomy (n=2). Engel class I-II outcomes were seen in all (100%) patients who underwent lesionectomy, 71% with sensorimotor corticectomies, and 57% with MSTs. Post-operative neurological deficit were present in 80% of lesionectomies, 85% of corticectomies, and 72% of MSTs at last follow-up.
Conclusions: Lesionectomies, limited resections of sensorimotor cortex, and/or MSTs may be performed with acceptable neurological morbidity in children with refractory seizures arising from Rolandic cortex. Lesionectomy yielded the best seizure control, followed by corticectomy, then MSTs.

30. Hemispheric Deafferentation Using Magnetic Resonance Imaging Guidance: An Alternative To Hemispherectomy
Ann-Christine Duhaime, MD; Richard P. Morse, MD; Greg Holmes, MD (Lebanon, NH)
Introduction: Hemispherectomy techniques have evolved with the goals of less tissue removal, shorter operative times, and fewer complications. We report five cases in which hemispheric deafferentation was performed (as per Schramm), facilitated by intraoperative MRI guidance.
Methods: Patients were 6-17 years of age with early onset refractory seizures from perinatal insults or congenital malformation. Workup included extensive seizure onset localization and functional mapping. Contrast-enhanced MRI was performed for intraoperative localization of pericallosal arteries, deep veins, ventricles, corpus callosum, and basal and midline structures. Initial steps included a limited peri-Sylvian craniotomy and anterior temporal lobectomy. A circumferential incision into the ventricle from the temporal to the frontal horn, sparing large vessels, disconnected the internal capsule. Complete callosotomy was performed just above the pericallosal vessels from inside the ventricle. Coronally-oriented basofrontal

and temperooccipital incisions extending to the midline disconnected the remainder of the hemisphere.
Results: Surgery lasted 5 - 6.5 hours; two patients required one unit of blood. All patients recovered to their preoperative neurologic status except for expected field cuts. No patient required a shunt. Length of stay was four to seven days. One patient had a wound infection requiring antibiotics. One patient had two brief postoperative seizures but none thereafter; all patients remain seizure free (followup 3 months to 2 years).
Conclusions: Hemispheric deafferentation using MRI guidance involves minimal removal of tissue and can be accomplished using relatively short operative times and hospital stays. In the authors' experience, use of MRI guidance improves anatomic accuracy and confidence with this type of disconnection approach to hemispherectomy.

31. Long Term Clinical Outcome In Children Who Underwent Revascularization Surgery For Moyamoya Disease
Raphael Guzman, MD; Marco Lee, MD, PhD; Theresa Bell-Stephens, RN; Bill Pickthorn, PhD; Michael Edwards, MD; Gary Steinberg, MD, PhD (Stanford, CA)
Introduction: We present the consecutive series of children with moyamoya disease treated at Stanford University by the senior author in the last 16 years.
Methods: The clinical records obtained in 68 patients undergoing 122 surgeries for moyamoya disease between 1991 and 2007 were retrospectively reviewed.
Results: There were 43 females and 25 males, the mean age at surgery was 9.9 years (1-18 years). Twelve patients had unilateral disease (17.6%). The presenting MRS was 1.74. Presenting symptoms were TIA (63%), stroke (78%), hemorrhage (3%) and seizure (28%). Nine patients had associated syndromes (4 neurofibromatosis, 3 Downs Syndrome, 1 primary dwarfism, 1 Alagille syndrome), 2 patients were post radiation therapy. We performed 90 (74%) direct and 30 indirect revascularization procedures. The youngest patient undergoing direct revascularization surgery was 5.3 years old. Among the patients older than 5.3 years 87% underwent direct revascularization. Surgical morbidity was 3.3% per procedure (5.9% per patient), 2.5% symptomatic strokes (2/3 made a complete recovery, 1/3 is less than 6months out of surgery), 0.8% hemorrhage (1 patient made full recovery). There was no surgical mortality. At a mean clinical follow up of 4.8 years (6months-15years), no patient suffered a late onset stroke or hemorrhage. Patients experienced a significant clinical improvement as measured by the MRS (pre-surgery 1.74 vs. 0.82 at follow-up, $p<0.0001$).
Conclusions: This series shows that revascularization procedures (direct revascularization in 74%) for moyamoya disease in the pediatric population can be done with a low morbidity and improves clinical disability. Patients seem to have a good long term prognosis.

32. Pediatric Neurosurgical Fellowships: A 15-year Review
Susan R. Durham, MD; Scott Shipman, MD, MS (Lebanon, NH)
Introduction: The Accreditation Council for Pediatric Neurosurgery Fellowships (ACPNF) was established in 1992 to oversee fellowship training in pediatric neurological surgery. The present study is a review of all fellowship graduates from 1992 through 2006 to identify predictors of American Board of Pediatric Neurological Surgeons (ABPNS) certification.
Methods: Basic demographic information including gender, year of graduation from residency, year of fellowship training, residency and fellowship training program, volume of cases/year for each ACPNF program and status of ABPNS certification was collected from public databases on each graduate. 19 of the 21 ACPNF-accredited programs provided data for this analysis. Individuals who did not meet ACPNF fellowship requirements (n=25, mostly foreign residency graduates) and those currently practicing in Canada were excluded (n=10).
Results: 134 individuals met criteria for analysis. Currently, 57 (42.5%) are ABPNS certified. There is a mean of 5.1 +/- 2.4 years (range 2-13 years) between finishing fellowship and ABPNS certification. If those individuals not expected to be sitting for the boards yet (2002-2006 graduates) are excluded, the rate of ABPNS certification is 60%. On average, 8.9 +/- 2.6 (range 3 to 14) fellows were trained per year. There is no significant relationship between fellowship program, residency program, institution case volume or gender and achieving ABPNS certification.
Conclusions: Extrapolating from this data, we can expect only 5.4 (60% of 9 yearly graduates) ABPNS-certified pediatric neurosurgeons to enterthe workforce each year. This suggests that the future pediatric neurosurgical workforce may be inadequate to meet the demands of increasing sub-specialization in neurosurgery.

33. Fluorescence And Diffuse Reflectance Spectroscopy For Intraoperative Guidance In Pediatric Brain Surgery
John Ragheb, MD (Miami Childrens Hospital and University of Miami, FL); Sanjiv Bhatia, MD (Miami, FL); David Sandberg, MD; Glenn Morrison, MD (Miami Childrens Hospital and University of Miami, FL); Wei-Chiang Lin, PhD; Sanghoon Oh, PhD; Bradley Fernald, BA (Miami Childrens Hospital and Florida International, FL)
Introduction: Fluorescence and diffuse reflectance spectroscopy have been used to detect in vivo physiological, biochemical, and structural changes in tissue associated with disease development. In addition to their high sensitivity and specificity, these modalities provide an unique advantage of real-time, non-destructive tissue characterization. The feasibility of intraoperatively using fluorescence and diffuse reflectance spectroscopy to enhance brain tumor and epilepsy surgeries has been investigated in the pediatric population.
Methods: Fluorescence and diffuse reflectance spectra were acquired from the in vivo brain using a fiberoptic spectroscopic system. The spectral acquisition was performed in both static and dynamic manners; therefore, the average and the time-dependent characteristics of the normal and diseased brain could be monitored. Analytical models of photon migrations were used to retrieve physiological characteristics of the brain, including hemodynamics and metabolism, from the recorded optical spectra. The results of the pathology and/or subdural EEG studies were incorporated in this study to classify recorded spectra; spectral alterations associated with abnormal pathological and EEG features could be identified.
Results: To date, 31 epilepsy patients and 20 brain tumor patients have been studied. Elevated diffuse reflectance signals, especially between 650 and 850 nm, were observed in both neoplastic and epileptogenic brain lesions. Some epileptogenic brain lesions show a unique blue shift in their fluorescence spectra. Unsynchronized alterations in local blood oxygenation and local blood volume were observed in some epileptogenic lesions.
Conclusions: These study results support the concept of using fluorescence and diffuse reflectance spectroscopy to aid pediatric brain tumor and epilepsy surgery.

34. The Analysis Of A Prospective Non-accidental Trauma (nat) Algorithm In Identifying Victims Of Child Abuse
Todd Maxson, MD; Joanne Adams, DO; George Edwards, MD; Timothy M. George, MD, FACS; Nicole Higginbotham, RN, MS, NP (Austin, TX)
Introduction: Because of the inherent bias in screening infants for non-accidental trauma, we developed a non-accidental trauma (NAT) algorithm that would be applied to every infant trauma not involving a motor vehicle. The goals of the algorithm were to determine the incidence of abuse in the community, the impact of head injuries on this population, and the ability to apply these principles without bias.
Methods: Over a one year period, all infants who presented to the emergency department with injuries not related to motor vehicle crashes were prospectively evaluated in the NAT pathway. The algorithm required assessment by emergency physicians, social work, trauma services, neurosurgery, orthopedics, ophthalmology, and the Child Assessment Team at Children's Hospital (CATCH).
Results: Fifty-one infants met criteria. Of these, thirty-three patients (65%) sustained brain injuries, hematomas and/or skull fractures. There were 17 females and 16 males. Sixteen were Caucasian, 5 African-American and 12 Latino. There was one death. Six injured infants (32%) were deemed the result of NAT.
Conclusions: Most NAT studies have a reporting bias because they rely on the judgment of the examiner to determine who is screened. Head injuries were the most common reason for the evaluation. Interestingly, the ethnicity of the NAT group paralleled the ethnicity of the community. Our pathway does not rely on any history except the presence or absence of an MVC. We believe a non-biased NAT pathway can be instrumental in capturing cases of abuse, free of bias.

35. Intracranial Fungal Granuloma In Immunocompetent Children: A Ten Year Clinicopathological Study
Faiz U. Ahmad, MD; Vikas Naik, MBBS, BSc; Aditya Gupta, MD; Ashish Suri, MD; Chitra Sarkar, MD; Ashok Mahapatra, MD; Bhawani S. Sharma, MD (India, New Delhi)
Introduction: Fungal brain lesions are usually seen in immunocompromised children and usually take the form of meningitis or ring lesions. Intracranial fungal granuloma (ICFG) is usually seen in adults and is rare in children. We report our experience in managing immunocompetent children with ICFG.

Methods: Retrospective review of case records of patients operated for ICFG over last 10 years was undertaken. Only histopathologically confirmed cases were included in study. Clinical profile, imaging findings, treatment, histopathology and outcome were analyzed.
Results: Out of 54 patients of ICFG analyzed, 8 were children (less than 18 years of age). Age ranged from 7 years to 17 years. There were 5 males and 3 females. Headache, proptosis and seizures were common presenting complaints (in that order). Five patients had anterior cranial fossa lesions, 3 had middle cranial fossa lesions and one patient had extension lesion into cerebellopontine angle. Three patients had extension of disease into paranasal sinuses. Correct preoperative diagnosis of fungal granuloma was made only in 3 patients. On histopathology, five patients had aspergillosis, two had madurella and one had mucomycosis. Two patients expired due to meningoencephelitis and infarcts. Rest all had good clinical outcome. Poor neurological status before surgery and opening of ventricles during surgery were poor prognostic factors.
Conclusions: ICFG is rare in children, is often misdiagnosed before surgery, and has high morality rate unless managed properly. Poor neurological status at presentation and opening of ventricles during surgery are poor prognosticators. Prompt therapy with antifungal drugs and radical surgery can lead to good outcome.

36. Quick-brain Magnetic Resonance Imaging For Non-hydrocephalus Indications

Symeon Missios, MD; Ann-Christine Duhaime, MD; Joseph Pekala, MD; Patricia Quebada, MD; Jorge Forero, RT; Susan R. Durham, MD (Lebanon, NH)
Introduction: "Quick-brain" MRI (fast spin echo T2) for assessing children with hydrocephalus was introduced in 2002. We have observed that high patient and physician satisfaction with this technique at our institution has led to an increasing frequency of its use for non-hydrocephalus indications. The goal of this study was to characterize, quantitate, and begin to assess the use of quick-brain MRI for these additional indications.
Methods: 913 consecutive quick-brain studies between 2/03 and 4/07 were entered prospectively into a radiology data base. All available clinical records were reviewed retrospectively to assign one or more of the following indications to each study: shunt/hydrocephalus; macrocephaly; follow-up Chiari malformation; brain cyst; screen prior to lumbar puncture; screen for congenital anomaly; trauma; and other. Changes in distribution of indications over time and clinical experience with each indication were reviewed. Patients who underwent both quick-brain and other imaging studies (complete MRI or CT) were used to compare techniques.
Results: The total number of quick-brain studies performed increased each year (from 86 to approximately 300/yr). The proportion of studies done for non-hydrocephalus indications also increased, from 23% to 50%. The most common indication was macrocephaly screening, with other indications being nearly evenly distributed. Quick-brain identified unexpected subdural collections, congenital anomalies, and mass lesions confirmed by additional studies; however, the false-negative rate remains unknown.
Conclusions: The role of quick-brain MRI for non-hydrocephalus indications is expanding, and appears promising for a number of screening and surveillance paradigms. "Quick-brain plus" protocols for specific indications may add sensitivity, and are under development.

37. Incidence And Natural History Of Aneurysms Associated With Arteriovenous Malformations In Children

Daniel M. Sciubba, MD; Ananth K. Vellimana; Joseph C. Noggle, BS; Graeme F. Woodworth, MD; Phillippe Gauilloud, MD; George I. Jallo, MD (Baltimore, MD)
Introduction: Arteriovenous malformations (AVMs) have an inherent risk of intracranial hemorrhage. It is well established that arterial aneurysms are associated with AVMs and may increase the risk of hemorrhage in adult patients with AVMs. However, the incidence and natural history of aneurysms in children with AVMs has not been described.
Methods: A retrospective review of children diagnosed with an AVM from 1991 to 2005 was performed. The clinical presentation was broadly classified as hemorrhagic, non hemorrhagic or asymptomatic. Conventional angiography was done in all patients and the AVMs were graded using the Spetzler-Martin grading system. Angiography was used to identify arterial aneurysms and determine their characteristics.
Results: Thirty-five children with AVMs were identified. Five patients had arterial aneurysms. Hemorrhage from an aneurysm was seen only in one. In this patient, two intranidal aneurysms appeared after stereotactic radiosurgery and were obliterated by subsequent microsurgery. In the other four patients, the aneurysms were identified in the initial angiogram. In three, the aneurysms were situated proximally on arterial feeders and in two patients they disappeared after AVM treatment. One patient was lost to follow up while another had an unrelated aneurysm.
Conclusions: The incidence of aneurysms in pediatric AVM is similar to adults. As in adults, intranidal aneurysms may have a higher chance of bleeding than aneurysms on feeding arteries, the latter of which may disappear with obliteration of the AVM. Therefore in children with AVMs, intranidal aneurysms should be managed aggressively, while management of proximal artery aneurysms may be dictated by the definitive treatment of the AVM.

38. Nasal Drainage Of Cerebrospinal Fluid Is Diminished In Hydrocephalic Rat Pups

Babak Behnam, MD, PhD; Jogi V. Pattisapu, MD; Meenu Madan, PhD; Matthias Rammling, MSc; Leena Paul, MSc (Orlando, FL)
Introduction: There is mounting evidence that spinal fluid absorption takes place at alternate sites which might serve as a reserve mechanism or be primarily involved in the hydrocephalic condition.
Methods: We compared the nasal pathway of the congenital Hydrocephalic-Texas (H-Tx) rats with control Sprague Dawley (SD) rats and affected hydrocephalic (HC) rat pups. The animals were examined by immediate post mortem sub occipital injection of 30-50 microliters of 2% Evans Blue dye in rat pups of 6 and 10 days of age (P6 and P10). The specimens were sectioned on dry ice and digitally captured images were compared and quantified for dye penetration from the cribriform plate into the nasal lymphatics.
Results: We found that control SD animals (11/16 at P6, and 10/15 at P10) and unaffected H-Tx (13/17at P6 and 13/16 at P10) had more dye visualization in the nasal regions compared with HC pups (0/4 at P6, and 5/15 at P10). This difference in dye penetration was more pronounced at 10 days of age by quantification of blue dye (relative score SD 24.5%, H-Tx 32%, and HC 18.8%). The dye was not visualized in the cervical lymph nodes or venous channels in our animals.
Conclusions: This study suggests that the alternate pathway (nasal lymphatic drainage) for CSF absorption is diminished in the hydrocephalic HC pups. Significance of this finding in cerebrospinal fluid homeostasis is currently being investigated by further studies.

39. Distressed Ependymal Cilia Movement In H-tx Hydrocephalic Rat Model

Meenu Madan, PhD (Orlando, FL); Matthias Rammling, MSc; Leena Paul, MSc; Babak Behnam, MD, PhD; Jogi V. Pattisapu, MD (University of Central Florida, FL)
Introduction: Disorders of ciliary structure or function may lead to abnormalities of cerebrospinal fluid homoestasis, including hydrocephalus. Ependymal cilia play a role in CSF circulation and absorption, and dysfunction of these mechanisms may lead to the hydrocephalic condition.
Methods: Vibratome sections (200 micrometer thickness) were prepared from the lateral ventricles of SD (control), H-Tx (unaffected sibling) and HC (affected hydrocephalic) rats age 5 and 10 days in physiologic media at room temperature. Ciliary beat frequency was recorded at 500 frames per second using in-line high speed camera, and ciliary beat frequency was calculated.
Results: These preliminary experiments showed decreasing ciliary beat frequency of SD = 12.83, HTx = 9.86, and HC = 7.74. Anatomically, the ependyma have clustered, shorter, and thicker cilia, which is being further evaluated by scanning electron microscopy.
Conclusions: Accumulation of cerebrospinal fluid in the hydrocephalic condition may result from alterations in ciliary anatomy and motion. These mechanisms may result in aqueductal closure and future drug trials might be developed to improve the hydrocephalic condition.

40. Validation Of Noninvasive Measurements Of Intracranial Pressure Using MRI Technique With Invasive Intracranial Pressure Measurements In Pediatric Hydrocephalus

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Introduction: We recently reported the potential clinical utility of a new noninvasive MRI-based measurement of intracranial pressure (MR-ICP) in a series of symptomatic hydrocephalic patients. We found that MR-ICP measurement had a strong negative predictive value for surgery i.e. patients with normal MR-ICP did not require surgical intervention during the 3-month follow-up period. However, invasive monitoring techniques used to validate the results (lumbar puncture, EVD, or intraoperative ICP) were all performed hours or days from the time of the MR-ICP study, and were in a small number of adult patients. In the present study, we now have performed validation studies correlating invasive ICP measurements with noninvasive MR-ICP in 5 pediatric hydrocephalic patients.

Methods: This MR-ICP method utilizes the small phasic changes in intracranial volume (ICV) and pressure that occur with each cardiac cycle. The systolic increase in ICP and ICV are measured by imaging of the blood and CSF flow to and from the intracranial vault. The ratio of the change in ICP and ICV provides a measure of intracranial elastance, which is linearly related to ICP. These validation studeis were obtained by the simultaneous invasive measurements of ICP, via an indwelling EVD, measured at the time of the noninvasive MR-ICP determinations.
Results: Results from these patients demonstrated good agreement between the invasively measured ICP and the noninvasively measured MR-ICP.
Conclusions: These promising preliminary results suggest the potential clinical utility of this noninvasive means of measuring ICP (MR-ICP) in hydrocephalic patients and warrant further evaluation in a study of la arger number of patients.

41. A Logistic Regression Model To Predict Early Failure Of Endoscopic Third Ventriculostomy In Children

Jonathan Roth, MD; Shlomi Constantini, MD (Israel, Tel Aviv); Spyros Sgouros, FRCS (United Kingdom, Birmingham); Conor Mallucci, FRCS (United Kingdom, Liverpool); James M. Drake, MD, FRCS; Abhaya V. Kulkarni, MD, PhD (Canada, Toronto)

Introduction: Numerous studies have attempted to identify the significant factors that contribute to a successful endoscopic third ventriculostomy (ETV) in children. These studies do not, however, allow the surgeon to predict the expected probability of failure for a specific child with a specific combination of factors. Our study aimed to develop a logistic regression model that would allow for such prediction for individual patients, based on an analysis of one of the largest international datasets to date.
Methods: Data from 669 children undergoing ETV at 12 centers were included in this analysis. A multivariable logistic regression model was built using failure at 6 months as the outcome. The model was derived on 70% of the sample and validated on 30%. Adequacy of the predictive model was tested using ROC graphs and area under the curve (AUC).
Results: Mean age at ETV was 6.4 years. The most common hydrocephalus etiologies were aqueductal stenosis (31.1%) and tumour (30.1%). The 5 year success rate for all patients was 56.5%. The final logistic regression model, which included age at ETV and etiology of hydrocephalus, proved to have reasonable predictive accuracy for ETV failure, with AUC > 0.60. Predictive accuracy of the model for each of the larger individual centers was also good, with each AUC > 0.60.
Conclusions: This predictive logistic regression model will help surgeons determine the expected probability of failure of ETV in a child given that child's specific set of factors. This will help pediatric neurosurgeons and parents in decision-making about the procedure.

42. Comparison Of Conversion Rates From Temporary Csf Management To Permanent Shunting In Premature IVH Infants

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Introduction: Various temporary CSF diversion methods are used in the initial treatment of hydrocephalus secondary to high grade intraventricular hemorrhage of prematurity (pIVH) and differ by institution. The purpose of this study was to define the rate to permanent shunting and risk of infection in the two most commonly performed temporizing procedures: ventriculo-subgaleal shunt placement (SGS) and ventricular reservoir placement for intermittent tapping (RES).
Methods: Three member institutions of the HCRN participated in a retrospective review of pIVH patients treated at each institution between the years 2000-2006. Patients identified with grade 3 or 4 IVH, weighing less than 1500 grams, and undergoing surgery were included in the study. The rate of temporizing procedure conversion to permanent shunting as well as the rate of infection was determined.
Results: The percentage of patients undergoing permanent shunt placement after SGS was 91% (30/33) and for RES was 62% (54/87), (p<.001). The infection rates for SGS and RES were 15% and 13%.
Conclusions: The use of intermittent tapping of ventricular reservoirs in the treatment of hydrocephalus due to pIVH appears to have a lower incidence to permanent shunt placement than ventriculo-subgaleal shunt placement. There is no discernible difference in infection rates. This pilot study supports a randomized control trial.

43. Endoscopic Third Ventriculostomy Versus Vp Shunt - A Decision Analysis

James M. Drake, MD (Canada, Toronto); Abhaya Kulkarni, MD (Canada, Hospital for Sick Children, Toronto); John Kestle, MD (Primary Children's Centre, Salt Lake City, UT)

Introduction: Uncertainty persists on the best treatment for patients with obstructive hydrocephalus, endoscopic third ventriulostomy (ETV) or shunt, particularly in the younger age groups. We performed decision analysis for quality of life (QAL) outcomes comparing these two procedures.
Methods: Frequency of outcome events for ETV was obtained from the Canadian Pediatric Neurosurgery Study Group (368 patients) and for shunts from two prospective randomized trials, the Shunt Design Trial and the Endoscopic Shunt Insertion Trial (647 patients combined). QAL estimates for various outcomes were obtained from the literature. Decision analysis was performed at one year of follow up for specific age groups, < 1 mon, 1-6, mons, etc.
Results: Failure from CSF diversion from either procedure was a function of age with higher failures rates in the younger patients. Quality of life estimates at one year were marginally higher for ETV for all age groups, but the outcomes were similar enough to be regarded as equivalent. Sensitivity analysis indicated that QAL estimates for patients who are well with a functioning ETV or shunt, was quite important as was the severe complication rate from ETV.
Conclusions: Age is a major determinant of outcome for CSF diversion with worse outcomes in young patients. QAL estimates for either ETV or shunt are similar at one year.

44. The International Infant Hydrocephalus Study: Update Of The On-going Randomized Trial Of Endoscopic Third Ventricilsotomy Versus Shunt For Infant Triventricular Hydrocephalus

Spyros Sgouros, FRCS (United Kingdom, Birmingham); Shlomi Constantini, MD (Israel, Tel Aviv); Abhaya V. Kulkarni, MD, PhD (Canada, Toronto)

Introduction: There is still a great deal of uncertainty regarding the true efficacy and complications of endoscopic third ventriculostomy (ETV) to resolve obstructive hydrocephalus in infants, relative to CSF shunting. To date, there is no definitive study comparing ETV and CSF shunting.
Methods: To address the uncertainties, the International Infant Hydrocephalus Study (IIHS) was conceived in 2004, under the aegis of the International Study Group for Neuroendoscopy (ISGNE) and the International Society of Pediatric Neurosurgery (ISPN). This is a multi-center, international randomized controlled trial. The aim of this RCT is provide a structured, comprehensive, statistically meaningful comparison of the long term benefits of ETV versus CSF shunting as a treatment for triventricular hydrocephalus in infants under 24 months of age. Currently, there are 29 participating centers from Europe, North America, and South America. The study structure includes an international advisory board and an international safety monitoring committee. Long term outcome analysis will include treatment failures, complications, and hospitalizations. Importantly, however, the primary outcome for this RCT will be the overall health status of the child at 5 years of age.
Results: This is an on-going trial. A brief overview of the rationale and methodology of the IIHS will be provided along with an update regarding patient recruitment.
Conclusions: The IIHS is the first RCT comparing ETV to CSF shunting. The final results of this study will have important implications to the international pediatric neurosurgery community.

45. Medical, Social, And Economic Factors Associated With Health-related Quality Of Life In Canadian Children With Hydrocephalus

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Introduction: The objective of this study was to identify, within the context of a national universal healthcare system, the factors associated with health-related quality of life (HRQL) in children with hydrocephalus. A comprehensive conceptual model of determinants of child health was used that included medical, social, and economic factors, with reliable, validated outcome measures.
Methods: This was a cross-sectional study of outcome between November 2005 and November 2006 at three Canadian pediatric hospitals. 340 children, 5 to 18 years old with treated hydrocephalus, participated from a total of 366 eligible patients. Outcome was assessed by the parent-completed the Hydrocephalus Outcome Questionnaire (HOQ) and the Health Utilities Index Mark 3 (HUI-3).

Results: The children were assessed at a mean age of 11.6 years (SD 3.6) and a mean of 10.0 years (SD 4.6) from the initial diagnosis of hydrocephalus. The mean utility score for the sample was 0.58 with 5.0% having scores less than zero (i.e., an outcome considered "worse than death"). Adjusted multivariable linear regression models demonstrated that the most important determinants of poorer overall HRQL included: prolonged treatment for cerebrospinal fluid shunt obstruction, presence of seizures, myelomeningocele, worse family functioning, lower family income, and lower parental education.
Conclusions: The determinants of HRQL in children with hydrocephalus are varied and, despite a national universal healthcare system in Canada, socioeconomic disparities remain important. Given the absence of a parallel private healthcare system in Canada, this suggests that the impact of socioeconomic factors relate to issues beyond access to necessary medical care.

46. Impaired Lymphatic Cerebrospinal Fluid Absorption In Experimental Communicating Hydrocephalus
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Introduction: It has been assumed that the pathogenesis of hydrocephalus includes a cerebrospinal fluid (CSF) absorption deficit. Since a significant portion of CSF absorption occurs into extracranial lymphatic vessels located in the olfactory turbinates, the purpose of this study was to determine if CSF absorption was compromised at this location in a rat model of hydrocephalus.
Methods: Kaolin (n=10) or saline as control (n=9) was introduced into the basal cisterns of adult Sprague Dawley rats. The development of hydrocephalus was assessed using MRI and ventriculomegaly was calculated as the Evans ratio. Human serum albumin (125I-HSA) was injected into the lateral ventricles. The enrichment of 125I-HSA in the olfactory turbinates at 30 minutes post injection provided an estimate of CSF transport into the nasal lymphatic vessels.
Results: The average Evans ratio in the kaolin group (0.48 ± 0.02) was significantly greater than that in the saline injected animals (0.35 ± 0.01; $p = 0.0042$). The CSF tracer enrichment in the olfactory turbinates (expressed as percent injected/gm tissue) in the kaolin rats averaged 0.99 ± 0.39 and was significantly lower than that measured in the saline controls (5.86 ± 0.32; $p = 0.0019$). A plot of the Evans ratio versus lymphatic transport revealed a significant negative correlation ($p = 0.0002$) with the largest degree of ventriculomegaly associated with the lowest levels of lymphatic CSF uptak.
Conclusions: We conclude that lymphatic CSF absorption pathways are compromised in a kaolin hydrocephalus model suggesting an important role for extracranial lymphatic vessels in this CSF disorder.

47. Elevated Cerebrospinal Vascular Endothelial Growth Factor In Hydrocephalus: Therapeutic Implications?
Judah Folkman, MD; Joon W. Shim, PhD; Joseph R. Madsen, MD; Susan Connors, MA (Boston, MA)
Introduction: Vascular endothelial growth factor A (VEGF-A) is a member of the larger family of VEGF-related cytokines that mediates multiple functions of endothelial cells including proliferation, migration, and permeability. Current thinking on the pathogenesis of communicating hydrocephalus (the most common pediatric neurosurgical condition) focuses on pulsatile vascular mechanisms, but the biochemical and biological underpinnings remain obscure. We wished to begin exploration of a link between hydrocephalus, hyperpulsatility and increased VEGF.
Methods: We assayed VEGF-A in CSF gathered from patients undergoing intradural surgery for nonneoplastic conditions, including hydrocephalus by enzyme-linked immunosorbant assay (ELISA).
Results: ELISAs demonstrated that the CSF VEGF-A in hydrocephalic patients was elevated over controls (median, 82 and <15.6 pg/ml, respectively). Specifically, Mann-Whitney and Wilcoxon tests indicated that the two patient groups of control and hydrocephalus differ in CSF VEGF-A (pg/ml) at 95 % confidence level (p=0.004). Indeed, patients with other conditions of altered CSF flow pathways, which would also be expected to interfere with the intracranial or intraspinal pulsation absorption mechanisms (as in Chiari malformations, some arachnoid cysts, and the like) also had elevations in CSF VEGF.
Conclusions: VEGF-A may play an important role in the pathogenesis of hydrocephalus and blocking its action by antagonists such as endostatin may be a potential therapeutic approach. The success of anti-VEGF treatments in very low dose for edema associated with macular degeneration and diabetic retinopathy suggest that anti-VEGF treatment in hydrocephalus could in some cases be a therapeutic alternative or supplement to shunt insertion.

48. Emotional Functioning Of Children With Congential Hydrocephalus 10 Years Post Shunting
Martin Oliveria, PhD; Emily Austria, BS; Scott Hunter, PhD; Maureen A. Lacy, PhD; David Frim, MD, PhD (Chicago, IL)
Introduction: We examine the cognitive, behavioral and adaptive functioning of children with a history of hydrocephalus as assessed by their parents.
Methods: Parents of 32 children shunted within the first year of life and 16 healthy controls completed the following questionnaires: BRIEF, a measure of executive skill development; the Brown ADD Scales, which assesses attentional disorder symptoms; and the Scales of Independent Behavior, Revised (SIB-R), which assesses adaptive skill development. Responses were correlated by group and subjected to comparison by independent means 2 tailed t-tests.
Results: Parents of children with hydrocephalus reported greater problems in several executive domains than did parents of controls: Working Memory: 58.33 (10.06) vs. 49.75 (12.09). p=.009, Planning: 54.55 (10.07) vs. 48.75 (9.88) p=.06, and Self Monitoring: 55.40 (10.65) vs. 49.31 (7.65). On the SIB, scores were significant on measures of Broad Independence: 94.31 (32.37) vs. 123.47 (18.45) p=.001, Motor functioning: 93.25 (31.42) vs. 118.18 (17.17). p. =003, Social Communication skills: 99.42 (25.62) vs. 121.11 (16.08) p=.002, Personal Living skills: 99.80 (27.70) vs. 123.82 (20.27) p=.002, Community Living: 87.95 (31.69) vs. 113.82 (19.13) p=.003 and Support: 75.97 (20.30) vs. 88.35 (7.45) p =.02.
Conclusions: These findings indicate that children with hydrocephalus display a set of behavioral and adaptive skill weaknesses that are consistent with underlying deficits in frontal-executive functioning. These findings will be discussed in the context of current literature (i.e., Fletcher's et al). Knowledge of these deficits may assist in development of educational and behavioral interventions in school and at home.

49. Efficacy Of The Bactiseal Catheter In Pediatric Hydrocephalus
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Objective: To determine the efficacy of BactisealTM catheters compared to traditional catheters in the treatment of hydrocephalus.
Methods: Bactiseal catheters were retrospectively compared to traditional catheters implanted in patients between January 1, 2003 and December 31, 2006. A total of 245 patients (primarily pediatric) with 541 procedures, were follow for an average of 356 days. Only patients with ventriculoperitoneal or ventriculoatrial shunts with single ventricular catheters were analyzed. The infection and malfunction data was divided into two groups: Bactiseal and traditional shunt systems.
Results: There were 35 shunt infections examined: 17 Bactiseal (infection rate 6.44%) and 18 traditional (infection rate 9.09%). The average time to removal of Bactiseal catheters due to infection was 107.2 days verses 104.8 days for traditional catheters. No significant difference in the incidence of shunt infection between Bactiseal and traditional shunt systems was observed($x2 = 1.136$, $p = 0.286$); nor was there a significant difference in time to infection ($x2 = 1.915$, $p = 0.384$). A total of 182 shunt malfunctions occured: 94 Bactiseal (malfunction rate 35.61%) and 88 traditional (malfunction rate 44.44%). The average time to removal of Bactiseal catheters was 176.9 days verses 217 days for traditional catheters. There was no significant difference in the incidence of malfunction ($x2 = 3.702$, $p = 0.054$) or in time to malfunction ($p = 0.86$).
Conclusions: Prospective studies are needed; however, this retrospective analysis did not show a statistically significant difference in efficacy between Bactiseal and traditional catheters.

50. Aquaporin-1 And Aquaporin-4 Immunolocalization And Alteration In Hydrocephalic H-tx Rat Brain
Babak Behnam, MD, PhD; Leena Paul, MS; Matthias Rammling, MS; Meenu Madan, PhD; Jogi V. Pattisapu, MD (Orlando, FL)
Introduction: Aquaporins are a family of bidirectional transmembrane water channel proteins involved in some neurologic conditions including hydrocephalus. In brain, Aqp1 and Aqp4 are mainly expressed in choroid plexus and perivascular region, respectively. Hydrocephalus-Texas (H-Tx) rat is an animal model with hereditary hydrocephalus (HC) which is fatal by 4-5 weeks of age.

Methods: Whole brains of P5 and P10 day pups were fixed in Farmer's fixative, and paraffin embedded tissues were cut at a 3micron thickness. The Aqp1 and Aqp4 were detected with polyclonal antibodies, followed by horseradish peroxidase secondary antibodies and stained with diaminobenzidine (DAB) for light microscopy.
Results: Aqp1 was mainly expressed in choroid plexus, hippocampus, and dentate gyrus. Aqp1 expression is decreased in choroid plexus, but increased in dentate gyrus (CA3 region) of hydrocephalic animals. In control animals, Aqp4 is detected in glia limitans, ependymal epithelium, cerebellum, hippocampal dentate gyrus, and paraventricular nuclei of the hypothalamus. Aqp4 expression is significantly decreased in HC pups especially in the perivascular regions in the cortex. Interestingly, Aqp4 expression was not altered in the dentate gyrus and periventricular zones of the dilated ventricles.
Conclusions: Over expression of Aqp1 in dentate gyrus of hydrocephalic rat may indicate a possible link between aquaporins and ischemia. However, down-regulation of aquaporins in the hydrocephalic brain in our rat model may represent a primary defect resulting in ischemia resulting in hydrocephalus, or a secondary response to ischemia in the hydrocephalic condition. Modification of AQP1 and AQP4 expressions or functions might offer a good therapeutic strategy to improve hypoxia in hydrocephalus.

51. Vegf-r2+ Activation In The Caudate: An Adaptive Angiogenic Response To Hypoxia In Chronic Hydrocephalus?
Mark G. Luciano, MD, PhD; Abhishek Deshpande, MD; Stephen M. Dombrowski, PhD (Cleveland, OH)
Introduction: Chronic hydrocephalus is characterised by impaired gait, and associated with decreased cerebral blood flow and O2 delivery. VEGF which is triggered by ischemic/hypoxic events causes associated adaptive angiogenesis and also plays a critical role in neuronal protection. We investigated whether neuronal and glial VEGF-R2 expression is associated with an adaptive angiogenesis in the caudate.
Methods: We investigated the relationship between the duration and severity of hydrocephalus and % expression of VEGFR2+ neurons, glia and blood vessels (BV) in the periventricular and deep layers of the caudate. Hydrocephalic animal were divided into Short Term (ST, n=5) and Long Term (LT, n=5) and compared with Surgical Controls (SC, n=5). The density of blood vessels and cellular VEGF-R2+ was estimated using stereological methods.
Results: The %VEGFR-2+ neurons were significantly greater in CH (50%) than SC (20%) and %VEGFR-2+ glial cells were significantly higher in CH (70%), than SC (57%).The %VEGFR-2+ neuronal density was lower in the superficial region in CH-ST and SC whereas it was greater in the superficial region in CH-LT animals. The BV density was significantly lower in CH (ST, LT) than SC in the superficial caudate but not in the deep caudate.
Conclusions: The increase in %VEGF-R2+ neurons and glia in hydrocephalus indicates a stimulated VEGF response that may be related to hypoxia in the caudate. The observed increase in VEGF-R2+ was not associated with angiogenesis, however may play a role in neuroprotection. Modulation of VEGF receptors may be important in our understanding of the role of hypoxic in the pathophysiology of hydrocephalus.

52. Identifying And Treating Patients With Pseudotumor And Cerebral Venous Sinus Thrombosis
Stephanie L. Einhaus, MD; Michael E. Tobias, MD; Robert A. Sanford, MD; Michael Mulbauer, MD; Frederick A. Boop, MD (Memphis, TN)
Introduction: In this study we identified a subset of children with both pseudotumor and cerebral venous sinus occlusion and/or compromise.
Methods: This evaluation included 10 children that presented with signs and symptoms consistent with the diagnosis of pseudotumor cerebri. All patients had papilledema and elevated intracranial pressure, proven by lumbar puncture. Evaluation with MRI/MRV or angiogram revealed cerebral venous sinus occlusion or compromise.
Results: The age of the patients ranged from 3 to 18 years old. Of the ten patients, 5 were males and 5 were females. Four of the ten patients had cerebral venous sinus occlusion, and six had cerebral venous sinus compromise. The patients were managed conservatively with serial lumbar punctures, Diamox, and close ophthomological follow-up. Of the 10 children, 5 required shunts for progressive visual loss, and 3 have required prolonged Diamox therapy. All patients are followed until papilledema resolves and intracranial pressure returns to normal.
Conclusions: There is a subset of pseudotumor patients that have dural sinus occlusion or compromise. These patients should initially be managed conservatively, and the underlying etiology of the venous occlusion should be treated when possible. In our series, despite aggressive management, half of the patients required CSF diversion because of progressive visual loss. This data implies that this subset of patients may be more likely to fail conservative therapy.

53. Has The Ventriculoperitoneal Shunt Tap Outlived Its Usefulness
Steven C. Fulop, MD; Shervin Dashti, MD, PhD; Shenandoah Robinson, MD; Alan R. Cohen, MD; Jonathan P. Miller, MD (Cleveland, OH)
Introduction: Tapping of a suspected malfunctioning ventriculoperitoneal shunt is easy and informative, but also potentially dangerous. The purpose of this study is to determine the effectiveness of a shunt evaluation protocol that does not involve direct shunt tapping except in rare and specific cases.
Methods: We adopted a protocol for shunt evaluation that involves shunt tapping only in cases of suspected infection or in patients with non-communicating hydrocephalus and equivocal CT findings. We then reviewed the clinical characteristics and surgical findings in 373 consecutive assessments of 155 pediatric patients evaluated for shunt malfunction and/or infection using this protocol between January 2003 and December 2005.
Results: Mental status change and headache were the symptoms most concordant with shunt malfunction, but no symptom had a predictive value much better than 50%. CT scan demonstrated enlarged ventricles in 72 out of 126 patients undergoing shunt revision. Among those with obstruction but without remarkable CT changes, eight had evidence of distal obstruction on X-ray "shunt series" consisting of skull, chest, and abdominal x-rays; five had obvious symptoms that rendered further testing unnecessary; and thirty-eight were diagnosed by elevated opening pressure on lumbar puncture (mean 34.7 cmH2O). Shunt tap was required in only eight cases (2%).
Conclusions: We have shown that it is possible to evaluate a majority of shunt malfunctions without tapping the shunt. Since it is usually possible to correctly diagnose shunt obstruction by safer means, the shunt tap may best be abandoned as a routine test of shunt patency.

54. Endoscopic Third Ventriculostomy, Analysis Of Failure
Juan Alzate, MD; David H. Hoffman, BA (Bronx, NY); Rick Abbott, MD (Bronx, NY)
Introduction: ETV is considered the initial surgical procedure of choice for treating both communicative and obstructive hydrocephalus. The goal of this study is to evaluate the operations performed once the initial ETV fails, including their time interval, failure rates and complications.
Methods: A retrospective analysis of clinical notes, operation records, and pre- and postventriculostomy neuroimaging data was performed to determine how failed ETV were managed.
Results: 146 patients that had undergone the ETV from 1993-2006 were analyzed. 51 of these patients experienced a failure of their ETV, yielding an initial ETV success rate of 65%. 31 (61%) of those failing their initial ETV were shunted and 3 were shunted after a repeat ETV failed. 15 (29%) of those failing their initial ETV underwent only one repeat ETV, while 2 required multiple ETVs. All repeat ETVs were performed more than 1 month after the initial ETV. Of the 2 cases that required 3 repeat ETVs, all were placed more than 1 month after the previous ETV. 19 of the 34 cases of failed ETV managed with shunt insertion were done less than 1 month after ETV failure while 15 were done more than 1 month after the ETV. Complications were noted in 5 of the 23 repeat ETVs performed. There were 3 cases (13%) post-operative infection, 1 case (4%) of CSF leakage, 1 case of transitory hemiparesis yielding an overall rate of complications of 22%.
Conclusions: Repeat ETV is a viable option in the management of failed ETV.

55. Endoport Neurosurgery: Air Medium Endoscopic Intraventricular Tumor Resection
Devin V. Amin, MD, PhD; Amin Kassam, MD; Elizabeth Tyler-Kabara, MD, PhD; L. Dade Lunsford, MD (Pittsburgh, PA)
Introduction: The challenge of resecting intraventricular tumors and colloid cysts has resulted in many creative innovations to optimize surgical approaches to these lesions. We have adopted the use of endoscopic techniques and a uniform outward radial force tubular conduit which is placed with Leksell G frame based stereotactic guidance and intraoperative CT imaging. This technique has been employed in our series of 50 adult patients (reported in a separate puplication), and we now report the technical aspects of applying this technique to four pediatric patients.
Methods: The endoport is a transparent tube (11.5 mm diameter) that functions as a cylindrical conduit once it is positioned with a blunt introducer over a stereotactic guide needle. The ability of the endoport to pivot about two axes enables the resection of intraventricular tumors and colloid cysts that are larger than the port's diameter.

Results: All patients underwent gross total resection without neurologic deficit. The creation of an air medium within the ventricle by drainage of the cerebrospinal fluid (CSF) improves visualization and hemostasis. The use of bipolar cautery along with topical hemostatic agents provides hemostasis as with traditional microsurgical techniques.
Conclusions: The endoscopic visualization in an air medium is superior to fluid based endoscopic techniques since blood does not mix with the CSF and obscure the operative field. The ability to use regulated suction, bipolar cautery, microsurgical cottonoids and ultrasonic aspiration enables removal of lesions that would not be amenable to fluid based through channel endoscopy due to their size, vascularity or degree of calcification.

56. Neurological Morbidity After Brainstem Tumor Surgery In Children
Carlo Mazza, MD; Barbara Masotto, MD; Albino Bricolo, MD; Alessandro Segna, MD; Miriam Mulino, MD; Francesco Sala, MD; Paola Lanteri, MD, PhD; Francesco Procaccio, MD (Italy, Verona)
Introduction: Brainstem tumor surgery can achieve cure or disease control in focal/exophytic low grade gliomas, but it remains challenging because of neurological complications. We reviewed surgical morbidity in 55 children operated on with (n=28,INM group) and without (n=27,historical group) intraoperative neurophysiological monitoring(INM).
Methods: Between 1995 and 2006 we operated on 55 children (age 1-17,mean 10 years) with brainstem tumors presenting with focal(n=21), exophytic(n=29) or diffuse(n=5) MRI pattern. Predominant location was midbrain(n=17), pons(n=9), medulla(n=25) or fourth ventricle(n=4). Since 2000 surgery was performed under multimodality INM including mapping of corticospinal tracts and cranial nerve motor nuclei, and motor evoked potential monitoring of corticospinal and corticobulbar tracts. Two way tables and analysis of the variance(ANOVA) were used to compare results between the INM and the historical group.
Results: Removal was classified as total(n=19), subtotal(n=33) or partial/biopsy(n=3). Low grade astrocytomas prevailed (n=36). Eighteen children(33%) had post-operative worsening of motor(4%), cranial nerve(13%) or both(16%) functions. Yet at the follow-up, available in 42 children (3-74 months, mean 28), neurological functions recovered to their pre-operative status in all children except 7 (13%:2 facial weakness,5 oculomotor disturbances) and MRI showed disease control in 24. In the INM group we observed shorter intensive care (3.7 vs 8 days) and hospitalization (14 vs 18 days), extubation was achieved significantly faster (0.3 vs 1.8 days,p=0.014) and per os feeding started earlier (3.8 vs 8 days,p=0.033).
Conclusions: Microsurgical skills and dedicated post-operative care allow tumor debulking and/or disease control in selected patients with not diffused brainstem tumors. INM impacts favourably on this surgery, improving post-operative management.

57. Retrospective Review of Pediatric Anaplastic Astrocytomas
Tedi S. Vlahu, BS; Mark D. Krieger, MD; Ira E. Bowen, BA; J. Gordon McComb, MD (Los Angeles, CA)
Introduction: The rarity of anaplastic astrocytoma among the pediatric population has made it difficult to assess factors associated with long-term survival. Understanding patterns between patient characteristics, degree of resection, progression-free survival(PFS) and overall survival(OS) would allow neurosurgeons to plan more aggressive surgical resection should it allow a prolonged survival.
Methods: A 15-year retrospective review at a single institution was conducted under IRB approval. The diagnosis of anaplastic astrocytoma was confirmed histologically according to World Health Organization(WHO) criteria. From January1993 to June2007,50 patients were diagnosed with anaplastic(WHO grade III) astrocytoma. There were 24(48%) male and 26(52%) female patients. The average age at diagnosis was 8.23years with an average time since last follow-up of 6.25years. According to both surgical and radiographic reports,21(42%) patients underwent gross total resection(GTR) while 12(24%) underwent subtotal resection(STR) and 17(34%) underwent biopsy.
Results: Of those patients with GTR, 18(36%) had recurrent disease. Progression was seen in 10(20%) patients with STR and 12(24%) patients with biopsy. With GTR, the average PFS was 1.90years. This is significant when compared to average STR PFS of 6.04months(p=0.04) and average biopsy PFS of 6.07months(p=0.04). Those who underwent GTR had an average OS of 2.95years. This is significant when compared to average STR OS of 0.98 years(p=0.02) and the average biopsy OS of 1.11 years(p=0.04). STR does not offer an advantage over biopsy for PFS(p=0.99) or for OS(p=0.61). Age, sex, and tumor location did not affect PFS or OS.
Conclusions: The degree of surgical resection correlates strongly with a significantly increased PFS and OS when compared to either STR or biopsy resection strategies.

58. Pilocytic/pilomyxoid Astrocytomas: Does Histology Co-relate With Clinical Behavior?
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Introduction: Recently described Pilomyxoid Astrocytoma(PMA), is regarded as aggressive variant of Pilocytic Astrocytoma(PA), occurring in young children, generally in hypothalamus-chiasmatic region. Our clinical experience since 1999 showed discrepancies in pilomixoid behavior. To better understand and define the pathophysiology of this tumor, we reviewed all cases with histologic diagnosis of pilocytic/pilomyxoid astrocytoma at our unit(1987-2004).
Methods: 93 cases were selected from histopathology archives(1987-2004). Formalin-fixed, paraffin embedded tissue was reviewed with Alcian Blue staining and immunohistochemistry for Ki67 was done, to look for features of PMA. Clinical information (age, location, clinical course) obtained in 68 cases was independently analyzed for clinical aggressiveness and outcome. The two datasets were then married-up.
Results: Histologically, 82 cases were PAs and 11 had pilomyxoid features. 7 out of 11 PMAs had been earlier classified as PA. Amongst the 11 PMAs, there were six children(under 16) and five adults. Six tumors were hypothalamo-chiasmatic, two cerebellar, two frontal and one thalamic. Six cases behaved aggressively. One distant spread, one recurrence and one evolution to PNET were noted. Clinical aggressiveness was seen in 3 out of 60 PA patients. There was no distant spread. Three cases recurred without change in subsequent histology. 55% PMA and 17% PA patients died of their disease.
Conclusions: PMA can occur in both adult and pediatric population in variety of locations, not just hypothalamic-chaismatic region. Clinically PMA's demonstrate more aggressive behavior as compared to PA and may account for some of the differences in behavior in PA in the past. Our study justifies managing PMA as a separate entity.

59. Phosphodiesterase Type 4 Drives Brain Tumor Growth In Vivo
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Introduction: Maintaining low levels of cAMP is essential to brain tumor growth. Conversely, increasing cAMP by PDE4 inhibition has been shown to inhibit tumor growth. In the current study, we characterize the growth regulatory properties of PDE4 and evaluate the potential anti-neoplastic effect of rolipram, a specific PDE4 inhibitor.
Methods: Daoy medulloblastoma and U87glioblastoma cell lines were infected with a lentiviral GFP-luciferase construct and orthotopically implanted into nude mice. For PDE4 overexpression, a PDE4 transgene was transfected. Tumor growth was monitored by non-invasive bioluminescence imaging. In vitro determination of tumor cell proliferation was made using BrdU immunofluoresence, and apoptosis was determined with TUNEL staining. Conformal radiotherapy was performed using microRT, and chemotherapy agents were administered via drinking water.
Results: Overexpression of PDE4 resulted in accelerated growth of orthotopically implanted Daoy medulloblastoma and U87 glioblastoma cell lines. Further, inhibition of PDE4 with rolipram decreased tumor growth and increased survival in mice bearing U87 xenografts. These effects of rolipram were mediated through both decreased proliferation and increased apoptosis. Significantly, addition of rolipram to the current standard glioma treatment regimen, temozolomide and radiation, resulted in not just arrest of tumor growth, but rather tumor regression and prolonged survival.
Conclusions: PDE4 is an important growth regulator in malignant brain tumors. In this study, inhibition of PDE4 by rolipram suppressed tumor growth increased survival. Addition of rolipram to the standard glioma treatment (temozolomide and radiation) resulted in tumor regression. Rolipram should be formally investigated as an anti-neoplastic agent for the treatment of malignant brain tumors.

60. The Role Of Intraoperative Arachnoid And Cerebrospinal Fluid Sampling In Children With Posterior Fossa Brain Tumors

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Introduction: Cerebrospinal fluid (CSF) and arachnoid tissue sampling at the time of posterior fossa tumor surgery may provide information regarding dissemination and prognostic grading.

Methods: CSF and arachnoid were sampled at surgery and analyzed for dissemination. Patients were divided into group A (high metastatic potential) or group B (low metastatic potential). The results were compared with conventional staging and with disease outcome.

Results: There were 39 (55.7%) group A patients and 31 (44.3%) group B patients. Median follow-up was 22.7 months. Tumor dissemination was confirmed in 13.4% (9) of arachnoid samples and in 22.2% (14) of CSF samples. Arachnoid or CSF positivity was greater in group A than in group B (18.9% versus 6.7%, p=0.14; 38.9% versus 0.0%, p=0.0002). Of group A patients, a conventional stage of M1+ was present in 71.4% when arachnoid was positive and in 64.3% when CSF was positive. Patients with positive arachnoid sampling had a 66.7% incidence of disease progression compared to 30.4% of patients with negative sampling (p = 0.03). Disease progression occurred in 69.2% of patients with positive cytology compared with 33.3% of patients without (p=0.02). When either positive arachnoid sampling or CSF cytology was integrated into prognostic grade, the predictive value of progression was 100.0% or 87.5%, respectively, compared with 76.9% with conventional staging.

Conclusions: Arachnoid infiltration or CSF dissemination detected at the time of surgery in patients with posterior fossa brain tumors is frequent. Intraoperative staging correlates well with conventional staging methods and enhances the predictive value of conventional risk categories.

61. Rathke's Cleft Cysts In The Pediatric Population

Gabriel Zada, MD; J. Gordon McComb, MD; Ira Bowen, BA; Sean McNatt, MD; Mark Krieger, MD (Los Angeles, CA)

Introduction: Background: Rathke cleft cysts (RCCs) are remnants of the craniopharyngial duct that occasionally arise in children and may affect development. Our goal was to review the Childrens Hospital Los Angeles experience with pediatric patients treated surgically for RCCs.

Methods: A database search was conducted to identify patients undergoing resection of a RCC between 1999-2007. Patient charts were retrospectively reviewed.

Results: Nine patients were identified and included in the study. The mean age was 12 years (range 2-17 years). There were 6 females and 3 males. The mean follow-up time was 26 months. Patients presented with the following symptoms: Headaches (6 patients, 66%), endocrinopathy (2 patients, 22%), visual loss (1 patient, 11%). The mean size of the lesions was 17.5 mm (range 16-20mm). Eight of nine patients underwent transsphenoidal resection of an RCC. One patient underwent a pterional craniotomy for resection. The median hospital stay was 4 days. Postoperative MRI demonstrated complete drainage of the cyst in 8 patients (89%). One patient required repeat surgery for a residual cyst. One patient demonstrated recurrence of a cyst 6 years following initial excision, yet did not require further surgery. Two patients developed transient diabetes insipidus whereas 1 patient developed persistent DI . At the most recent follow-up, 8 of 9 patients had resolution of their headaches.

Conclusions: RCCs may be safely resected via the transsphenoidal approach by resecting a portion of the cyst capsule and aspirating its contents. Resolution of headaches is common and normal development can proceed in many cases following resection.

62. Isolation Of Medulloblastoma Stem Cells Using Signaling Pathway Reporters

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Introduction: A major challenge in neuro-oncology is the identification of brain tumor initiating cells, the only cells capable of recreating the disease. In some brain tumors, the presence of the normal neural stem cell-associated antigen, CD133, could predict the tumorigenicity of cells. However, experiments in our lab show that CD133 may not be a universal marker for Medulloblastoma stem cells (MBSC), and alternative experimental strategies are required. Our hypothesis is that activity of signaling pathways may be a distinctive and more general hallmark of tumor initiating cells.

Methods: We developed a paradigm for the identification of cancer stem cells in Medulloblastoma, in which mutations affecting the Hedgehog or Wnt pathways were implicated. A transplantation model for primary human Medulloblastoma was established in mice, which allows us to directly assess the tumorigenicity of select tumor cell populations. To measure the activity of Wnt and Hedgehog signaling pathways, lentivirus-based reporters were generated in which GFP transcription is regulated by ß-catenin or Gli, respectively

Results: Using pathway reporters we have isolated by FACS primary human Medulloblastoma cells expressing GFP. The relevance of these signaling pathways to tumor initiation was then tested in in vitro clonogenic assays as well as in vivo tumor transplantation experiment.

Conclusions: The isolation of enriched populations of MBSC will advance our understanding of brain tumors. The purification of MBSC will be followed by the characterization of mutations, chromosomal aberrations, active signaling pathways and unique surface antigens. This knowledge will guide the development of highly specific and more effective anti-brain cancer therapies.

63. A Stem Cell Based Infiltrative Model Of Pontine Glioma

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Introduction: Diffuse pontine gliomas are universally fatal without proven therapy other than palliation. Future clinical trials utilizing local chemotherapeutics or antibody-based treatments may depend upon the development of representative animal models. No radiographically and histologically accurate model currently exists with which to perform animal studies.

Methods: Glioma stem cells from WHO Grade IV glial neoplasms were harvested. CD133+ cells were isolated from explants and expanded in vitro utilizing EGF and bFGF-containing media. Cells were stereotactically infused into the pons of athymic Sprague-Dawley rats and allowed to engraft. Animals were serially assessed radiographically with magnetic resonance and clinically before sacrifice and histological examination.

Results: Animals were imaged at several post-infusion time points and sacrificed after progressive neuological decline at 24-32 weeks. Before sacrifice, brains demonstrated T2-hyperintense, diffuse lesions. Light microscopy demonstrated infiltrative tumor, engorged vascular structures, and cellular heterogeneity. Immunoflouorescence demonstrated an immature glial-origin tumor with hypercellularity and vascular proliferation utilizing antibodies recognizing nestin (neuronal precursor cells), GFAP (astrocytes), beta-tubulin (neurons) and laminin (blood vessels). Fluorescent in-situ hybridization cytogenetic analysis demonstrated tumor cells of human origin containing EGFR gene amplification.

Conclusions: Our novel model represents a radiographically and microscopically accurate pontine glioma. In contrast to existing models, tumors develop over several months allowing sequential clinical and radiographic assessments of therapeutic interventions. Therapies such as implanted infusion catheters may depend upon this tumor specific model. This model also demonstrates the potential feasibility of developing patient-specific animal models derived from tumor biopsy-derived stem cells.

64. Identification Of Specific Inhibitors For Brain Tumor Stem Cells

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Introduction: Recent advances in stem cell research have allowed for the demonstration of the existence of cancer stem cells in several cancers including some brain tumors. Cancer stem cells in each organ exhibit some genetic and/or cellular similarities with their somatic stem cells. Previously, we found that a gene encoding the serine/threonine kinase, maternal embryonic leucine zipper kinase (MELK), is highly expressed in tumor spheres derived from brain tumor stem cells (BTSC), and regulates their survival and proliferation. Therefore, we hypothesized that inhibitors for MELK eradicate BTSC, resulting in inhibition of malignant brain tumor growth.

Methods: (1) We screened MELK inhibitors using cultured BTSC from pediatric GBM and MB. (2) We characterized the identified MELK inhibitors to determine whether the inhibitors interfere with survival of BTSC, their derivatives, and/or normal neural stem cells.

Results: (1) Several compounds were identified by our screening and they were found to inhibit MELK expression. (2) The identified compounds contained those which cause apoptosis of BTSC, but not their derivatives or normal neural stem cells.

Conclusions: MELK is highly expressed in some BTSC and is required for their survival. Inhibition of this gene can target stem cell component in pediatric malignant tumors, leading to growth inhibition of the entire tumor mass.

65. A Comparison Of Intracranial And Lumbar CSF Cytology In Staging Pediatric Medulloblastomas And Ependymomas

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Introduction: CSF dissemination is an ominous feature of pediatric brain tumors, occurring in at least 25 % of medulloblastomas and 10 % of ependymomas. Detecting early dissemination is important for determining both treatment and survival. Dissemination can be detected by MR imaging of the full neuraxis, cytology of CSF obtained via lumbar puncture (LP), and cytology of intracranial CSF. Our objective was to compare the sensitivity and specificity of CSF obtained intracranially (either intraoperatively or via ventriculostomy) and via lumbar puncture against the rate of dissemination determined by MR imaging.

Methods: Medical records, pathology reports and radiology reports for 92 patients who had resection of brain tumors (medulloblastoma, n=64; ependymoma, n=28) in the last 15 years were retrospectively reviewed. Radiology results were compared with the CSF cytology results.

Results: 10 patients (11%) presented with disseminated disease depicted on MR images at presentation. Intracranial CSF cytology had a sensitivity of 67 % and specificity of 82 % in detection of disseminated disease. Lumbar CSF cytology had a sensitivity of 17% and specificity of 95% in detection of disseminated disease.

Conclusions: Based on the results, intracranial CSF cytology is a more sensitive, but less specific technique than lumbar CSF cytology for detecting disseminated disease. Treatment protocols should keep these data in mind when evaluating diagnostic results.

66. Pre-operative Embolisation In Choroid Plexus Tumours In 12 Children: An Update On A Departmental Experience

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Introduction: Choroid plexus tumours are rare neoplasms of neuroectodermal origin. Surgical management of these highly vascular tumours remains challenging to date due to intraoperative haemorrhage.

Methods: 12 children, 10 boys and 2 girls with a mean age of 2.96 years, were treated at Great Ormond Street Hospital between September 2005 and March 2007. In all cases the MRI features were typical for a choroid plexus tumour. 6 tumours were located in the trigone, 4 in the posterior fossa and 2 within the 3rd ventricle. All children underwent a pre-operative angiogram with an attempt to catheterise and embolise the feeding arteries supra-selectively.

Results: One child with a large trigonal tumour could not be embolised due to vascular distortion secondary to tumour mass effect. One child with a 3rd ventricular tumour only had 1/3 of the lesion embolised, the remaining supply coming from transependymal feeders. Both children later required multiple, staged resections. A complete surgical resection was achieved in all 12 patients. The successfully embolised group still required blood transfusions but the surgical field was less haemorrhagic and a complete tumour resection could be achieved with a single operation. As a coincidential finding, CSF production dropped dramatically in the successfully embolised group, who had required and EVD, and the absence or presence of transependymal feeders was the best radiological indicator for histology.

Conclusions: Pre-operative embolisation of choroid plexus tumours is a safe procedure which aids complete surgical resection and helps to reduce surgical morbidity and mortality associated with intraoperative bleeding.

67. Stereotactic Radiosurgery in Recurrent Pediatric Ependymomas

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Introduction: Survival after diagnosis of ependymoma correlates best to the extent of surgical resection. Prognosis is poor with residual disease and is worse yet after a recurrent tumor. We have used stereotactic radiosurgery to treat small amounts of residual ependymoma after operations for recurrent disease in nine patients and report our experience.

Methods: Relapsed patients had received radiation therapy after initial resection, or after a first recurrence. After operation for recurrence, 7 patients with incomplete resections, and 2 with concern for residual disease that was not radiographically apparent, underwent stereotactic radiosurgery (11.5-24 Gy, in 1 or 3 fractions).

Results: This has resulted in cure (event free survival of greater than 5 years) in three patients and event free survival of greater time than to recurrence in a fourth (3 years). Three others have had no recurrence after 6, 16 and 19 months respectively. Another is recently diagnosed with recurrence after 4 years progression free survival and one who recurred 7 months after SRS has subsequently died. By contrast, our patients with multiple re-resections and chemotherapy had 0% survival.

Conclusions: Previous series indicated SRS not of significant benefit in this patient population. Median survival in patients with reoperation and SRS in this series is 68 months. This is better than in other series and we believe SRS may be a curative adjunct in well selected patients with residual ependymoma. SRS should be reconsidered for broader use in recurrent ependymomas. Further studies should help define optimal dosing regimens.

68. Direct Administration Of Chemotherapy Into The Fourth Ventricle In A Piglet Model

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Introduction: We hypothesize that chemotherapy infusions directly into the fourth ventricle may potentially play a role in treating malignant posterior fossa tumors. In this study we tested the safety and pharmacokinetics of etoposide administration into the fourth ventricle via an indwelling catheter in piglets.

Methods: We inserted a closed-tip silicone lumbar drain catheter into the fourth ventricle via a posterior fossa craniectomy and instilled five daily infusions of etoposide (0.5 mg; n=5) or normal saline (n=2). Animals underwent daily neurological examinations, 4.7 Tesla MRI scans after the final infusion, and then were sacrificed for post-mortem examination. Pharmacokinetics were studied using reversed-phase high performa nce liquid chromatography on cerebrospinal fluid and serum samples.

Results: All pigs remained neurologically intact. MRI scans demonstrated catheter placement within the fourth ventricle without signal changes in the brainstem or cerebellum. Serum etoposide was absent at two and four hours after intraventricular infusions. Cerebrospinal fluid etoposide levels progressively decreased at standard pharmacokinetic time points. Cytotoxic levels (greater than 0.1 microgram/milliliter) were maintained for five consecutive peak and trough measurements with one exception. Etoposide-related neuropathology included moderate-to-severe T-lymphocytic meningitis and fourth and lateral ventricular choroid plexitis with associated subependymal inflammation.

Conclusions: Etoposide can be infused directly into the fourth ventricle without clinical or radiographic evidence of damage. Cytotoxic cerebrospinal fluid etoposide levels can be maintained for 24 hours with a single daily infusion into the fourth ventricle via an indwelling catheter. Intraventricular etoposide elicits moderate inflammation, the long-term effects of which are as yet undetermined.

69. Intraoperative Neurophysiological Assessment Of The Motor System In Pediatric Neurosurgery

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Introduction: Intraoperative motor evoked potentials (MEPs) monitoring, besides preventing motor deficits, indirectly evaluates the maturation of motor pathways. Limitations in eliciting motor responses after bipolar 60Hz cortical stimulation (CS) are reported in younger children. We reviewed feasibility and age-related limitations in eliciting MEPs in 112 different neurosurgical procedures.

Methods: MEPs were intraoperatively recorded from limb muscles after multipulse (5-7 monophasic stimuli,500µs duration) transcranial electrical stimulation (TES) in children (mean age 8 years) with brain tumors(n=46) or AVMs(n=2), brainstem tumors(n=30), intramedullary spinal cord tumors(n=15), tethered cord(n=19). CS, with same TES stimulation parameters but lower intensity, was used in 23 children with brain tumors (mean age 4 years). We used the analysis of variance (ANOVA) to assess differences in stimulation intensities required to elicit baseline MEPs in different age groups.

Results: MEPs were monitorable in 94% of the children after TES and in 43% after CS. Stimulation intensities were significantly higher in younger children when comparisons were made between children younger and older than 4(p=0.0044),5(p=0.0025),and 6(p=0.0238) years, while the trend was not significant when the cut off was set at younger or older ages.

Conclusions: MEPs after TES can be easily monitored in Pediatric Neurosurgery. Additionally, this MEP technique allows CS for motor mapping in young children overcoming some limitations of the 60Hz technique. Yet, children younger than 6 years required stronger electrical stimulation to elicit MEPs. Maturation of cortico-motoneuronal connections occurs earlier in infancy, but our results could be explained by different degrees of neurophysiological development and the role played by inhibitory circuitries in young children.

70. A Proposed Grading System For Intramedullary Spinal Cord Tumors In Children: Predictive Value For Subsequent Progressive Spinal Deformity

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Introduction: Radical resection of intramedullary spinal cord tumors(IMSCT) can be achieved in the majority of cases with preservation of long-term function. Post-operative progressive spinal deformity often complicates functional outcome after surgery. It remains unclear which patients are at highest risk to develop progressive deformity.

Methods: We prospectively followed 164 children undergoing resection of IMSCT for development of spinal deformity requiring fusion(mean follow-up 5 years). Independent risk factors of postoperative spinal deformity were assessed via mulitvariate logistic-regression analysis. A grading scale(1-5) was created based on four preoperative variables found to be risk factors for post-operative deformity: 1)preoperative scoliosis(Cobb angle>10 degrees), 2)involvement of the thorocolumbar junction, 3)age <13 years, and 4)number of surgeries for IMSCT(Cumulative score: 1-5) and then retrospectively applied to this series of children.

Results: 43(26%) developed progressive spinal deformity requiring fusion. Age <13 years[OR(95%CI);4.39(1.5-12.4),p=0.005], preoperative scoliosis[OR(95%CI);3.25(1.4-7.6),p=0.01], involvement of thoracolumbar junction[OR(95%CI);2.77(1.06-6.7),p=0.04], and each subsequent revision resection[OR(95%CI);1.83(1.05-3.18),p=0.03] independently increased odds of deformity requiring fusion 4.4-fold, 3.2-fold, 2.8-fold, and 1.8-fold, respectively. Nine patients presented with grade I, 41 with grade II, 58 with grade III, 44 with grade IV, and 12 with grade V IMSCT. Increasing grade correlated with increasing incidence of fusion for subsequent spinal deformity[grade I (0%), grade II (5%), grade III (26%), grade IV (40%), and grade V (75%)].

Conclusions: Application of this grading scheme to a series of surgically resected pediatric IMSCT demonstrates its correlation with the incidence of postoperative progressive spinal deformity requiring fusion. The application of this standardized grading scheme will assist in the process of surgical decision-making and postoperative evaluation.

71. Pediatric Acoustic Neuroma

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Introduction: Acoustic neuromas are rare in the pediatric population. This tumor affects primarily the 8th, 5th, and 7th cranial nerves originating in the cerebellopontine angle. Children often present after a delay in diagnosis. Rates of recurrence and cranial nerve dysfunction may be related to surgical approaches.

Methods: The Loyola University Medical Center pediatric neurosurgery database was searched for patients under the age of 21 with a diagnosis of acoustic neuroma. Patients' records were retrospectively reviewed for demographic data, past medical history, chief complaint and presenting symptoms, neurological and radiographic findings, operative procedure, outcome, and complications.

Results: 13 pediatric patients were identified as meeting inclusion criteria. The average age at the time of surgery was 16.1 years. The chief complaints were headache, gait abnormality, sensory deficits, visual changes, tinnitus, and progressive hearing loss. Magnetic resonance imaging studies revealed an average tumor size of 4.7 cm. Three of these patients were diagnosed with neurofibromatosis type 2, all of which developed bilateral tumors. The patients had undergone surgery via translabyrinthine, retrosigmoid, or combined approaches with intraoperative facial nerve monitoring. Clinical outcomes were analyzed with respect to facial nerve activity and hearing preservation. Fifty eight percent of patients obtained normal to near-normal facial function (House-Brackmann Grades I and II). Hearing preservation was variable and related to the surgical approach.

Conclusions: Delay in diagnosis often leads to larger tumor size at the time of diagnosis in the pediatric population. Optimal facial nerve preservation was achieved using translabyrinthine, retrosigmoid, or combined approaches.

72. CyberKnife Radiosurgery in Pediatric Patients

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Introduction: CyberKnife Radiosurgery has advantages in the treatment of pediatric intracranial lesions including non-invasive immobilization low radiation exposure to the developing normal brain and ability to fractionate the treatment. This study was undertaken to evaluate the early results of CyberKnife Radiosurgery in Pediatric patients.

Methods: Pediatric patients were identified at the time of referral.

Results: CyberKnife Radiosurgery began at our institution in June 2004, since that time we have evaluated 418 for treatment and treated 315 (75%). That group included nineteen pediatric patients (ages 3-19) for evaluation and twelve (63%) who were treated. The pediatric patients tolerated treatment well. There were no acute complications, and no child required a general anesthetic. Three patients required conscious sedation. Twelve patients have been followed for more than six months and four (1 craniopharingioma, 3 astrocytomas) have demonstrated a response to treatment, including one dramatic reduction in tumor enhancement and mass effect . Two patients with visible tumor have shown no progression; two with no visible tumor have not recurred. CK also effectively controlled seizures resulting from a hypothalamic hamartoma Three experienced disease progression (1 sarcoma, 1 pituitary adenoma and 1 craniopharyngioma) and one patient was lost to follow up. The patients who were not treated with CyberKnife were treated with conventional therapy (3), surgery (2), no treatment (1) and one was lost to follow up.

Conclusions: Preliminary experience with CyberKnife Radiosurgery demonstrates that Pediatric patients are treated without significant difficulty, and with favorable outcomes in 75% of treated patients followed for more than 6 months.

73. Acute Endocrine Response Following Severe Traumatic Brain Injury In Children

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Introduction: Traumatic Brain Injury (TBI) is a major cause of death and disability in children, though much of the injury and its sequelae remain to be studied. Despite the prevalence of frontal injury following TBI with concomitant hypothalamic and pituitary involvement, endocrine dysfunction following TBI has not been studied in children.

Methods: To study the acute pediatric endocrine response after severe TBI (GCS < 8), cortisol, ACTH, TSH, T3, T4, free T4, GH, prolactin, LH, and FSH levels were obtained in 37 children (1- 17 y) on post injury days (PID) 1, 3, and 7.

Results: Our results showed that there was little endocrine dysfunction following TBI except that cortisol was significantly elevated (24.46 ± 13.41 µg/dL) on PID 1 along with ACTH but returned to "normal" (10.14-19.92 µg/dL) by PID 3; 46% and 14% of children had "low" cortisol and ACTH respectively in the acute period. Additionally, comparing 'poor' (GOS 3-5) to 'good' (GOS 1-2) outcomes, at PID 1 children with poor outcomes tended to have higher cortisol (28.8 ±17.58 µg/dL vs. 21.67 ±8.54 µg/dL) while TSH was slightly elevated at PID 3 (2.51 ± 2.41µIU/mL) in 'good' outcomes compared to 'poor' (1.21 ± 1.23 µIU/mL) (normal TSH 0.6-6.3 µIU/mL).

Conclusions: In summary, the endocrine response to trauma and stress in the acute period following severe TBI in children seemed appropriate though was abnormal in a number of children. These preliminary findings provide some insight into the acute response of the hypothalamic-pituitary axis following severe TBI, though further study is needed.

74. Laminoplasty Versus Laminectomy Is Associated With A Decreased Incidence Of Spinal Deformity After Resection Of Intramedullary Spinal Cord Tumors In Children

April Atiba, BS (Providence, RI); Kevin Yao, MD (Boston, MA); Fred Epstein, MD (New York, NY); Matthew J. McGirt, MD; Kaisorn Chaichana, BS; Frank Attenello, BS; George Jallo, MD (Baltimore, MD)

Introduction: Radical resection of intramedullary spinal cord tumors (IMSCT)can be achieved in many cases with preservation of long-term function. However, post-operative progressive spinal deformity often occurs years after surgery. We set out to determine if laminoplasty would reduce the incidence of subsequent spinal deformity.

Methods: After performing laminectomy for IMSCT resection in 144 consecutive patients we then performed laminoplasty in the subsequent 20 cases of IMSCT resection. We followed both cohorts for 1)development of progressive spinal deformity requiring fusion and 2)functional status(modified McCormick Scale[MMS] and Karnofsky Performance Scale[KPS]) by telephone interviews corroborated by medical records.

Results: Patients were 8.6±5 years-old and presented with median(IQR) MMS 2(2-4). Tumor spanned mean 6±3 spinal levels. >95% resection was achieved in 125(76%) cases. Preoperatively, laminoplasty versus laminectomy patients had better median(IQR) MMS score[2(2-2)vs2(2-4), p=0.04]. Otherwise, there were no differences between laminoplasty and laminectomy

patients. At mean five years after surgery, subsequent fusion for progressive spinal deformity occurred in 1(5%) case following laminoplasty versus 42(29%) cases following laminectomy,p=0.03. Adjusting for differences in preoperative MMS score, laminoplasty remained independently associated with a 7-fold reduction in odds of subsequent fusion [OR(95%CI);0.13(0.02-1.00),p=0.05]. Five years after surgery, median(IQR) MMS and KPS were similar between laminoplasty and laminectomy patients [MMS:2(2-3)vs2(2-4),p=0.54; KPS:90(80-90)vs90(70-100),p=0.40] despite a much higher rate of subsequent fusion in the laminectomy cohort.
Conclusions: Laminoplasty for pediatric IMSCT resection was associated with a decreased incidence of spinal deformity requiring fusion but did not effect long-term functional outcome. Laminoplasty for IMSCT resection may prevent further surgery for spinal stabilization in a subgroup of patients.

75. Chiari Malformations and Spinal Cord Injuries
Jeffrey W. Campbell, MD, MS (Wilmington, DE)
Introduction: Occasional reports have suggested an increased risk of cervical spinal cord injuries (C-SCI) associated with Chiari malformations (CM). The degree of this additional risk has never been quantified leading to inconsistent counseling about the need to restrict activities in children with otherwise asymptomatic CM.
Methods: The 1997, 2000, and 2003 KIDS databases, part of the Healthcare Cost and Utilization Project (HCUP), were queried for children with C-SCI both with (ICD-9 code: 806.0) and without (952.0) fractures. We identified children who also carried the diagnosis of a Chiari 1 malformation (348.4) and stratified by age, upper (C1-4) versus lower (C5-8) C-SCI, and presence of a fracture.
Results: 1968 children were identified with C-SCI over the three years, four of whom were also diagnosed with a CM. Adjusting for each hospital's weight to the discharge universe, the KIDS database would predict roughly 1300 C-SCI in children a year with 80% of these occurring in those 13 years or older and an overall 0.17% incidence of CM. Three of the Chiari's occurred in children with upper C-SCI, which did not reach statistical significance, compared to children with lower C-SCI. The database demonstrates the greater incidence of upper C-SCI ($p < 0.01$) and lower incidence of fracture ($p < 0.01$) in younger children.
Conclusions: The incidence of CM in children with upper C-SCI is not statistically different from those with lower C-SCI and appears similar to the incidence in the general population. This suggests that the additional risk of SCI in children with Chiari malformations is very small.

76. Cervical Spine Clearance Of Non-communicative Children After Trauma
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Introduction: Cervical spine clearance in non-communicative children after trauma can be difficult. Children may not be able to communicate effectively because of their young age or severe injuries requiring intubation and sedation. Currently, no published guidelines are available to help decision-making in these complex situations. The purpose of this study was to determine if a protocol-driven system could be developed that was safe and effective for clearance of the cervical spine in non-communicative children.
Methods: Data regarding cervical spine clearance in young (ages 0-3 years) and/or intubated children admitted after trauma activation at Primary Childrens Medical Center or the Morgan Stanley Childrens Hospital of New York from 2002-2006 were collected and reviewed. Radiographic and clinical methods of clearing the cervical spine, as well as the type and management of injuries, were determined.
Results: There were a total of 2828 trauma activations requiring cervical spine clearance during the study period. Of these, 779 (28%) were children 3 years of age or less and/or intubated and admitted to the hospital. To facilitate clearance in these children, imaging studies including plain radiographs (100%), CT (18%), and MRI (12%) were obtained. Thirty ligamentous injuries (3.9%) and 14 fracture/dislocations (1.8%) were detected, with 6 patients requiring operative stabilization (0.8%). No late injuries have been detected.
Conclusions: The protocol utilized has been effective in detecting cervical spine injuries in non-communicative children after trauma. The combination of clinical information and radiographic studies is essential for safely clearing the cervical spine in these complex situations.

77. Intracranial Pressure And Cerebral Perfusion Pressure As Risk Factors In Children With Traumatic Brain Injuries
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Introduction: The authors evaluated the initial intracranial pressure (ICP) and cerebral perfusion pressure (CPP) as prognostic factors in severe head injury in children and tried to determine the optimal CPP range.
Methods: This is a nine-year retrospective review of all patients with severe traumatic brain injuries (TBIs) who required invasive ICP monitoring and were admitted to the pediatric intensive care unit between 1995 and 2003. Clinical records and imaging studies were reviewed.
Results: A total of 156 pediatric patients were identified. Half of these patients presented with normal initial ICPs (< 20 mmHg), and a good outcome was achieved in 80% of these children. An unfavorable outcome was observed in more than 60% of patients with an initial CPP lower than 40 mmHg. The proportion of patients with unfavorable outcome decreased to 10% with initial CPPs higher than 60 mmHg, but patients with initial CPPs higher than 70 mmHg did not showed further improvement in outcome.
Conclusions: Initial ICP and CPP measurements were useful as prognostic factors in pediatric patients with severe TBIs. Patients with initial CPPs between 40 and 70 mmHg were found to have a better neurological prognosis than those with CPPs either above or below that range.

78. Treatment Of Pediatric Atlantoaxial Instability With Harms Fusion Constructs
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Introduction: There are several treatment options for rigid fixation at C1-C2 including Brooks and Gallie type fusions. The use of a Harms fusion, a construct with C1 lateral mass screws and C2 pedicle screws, has not been extensively described in pediatric patients.
Methods: During a 2-year period (2005-2006), patients were treated at the Children's Hospital of Philadelphia for atlantoaxial instability with a Harms fusion.
Results: Five patients were treated utilizing a fusion construct containing C1 lateral mass screws and C2 pedicle screws. The patients ranged in age from 7 to 17 years old (mean 13yrs). Two patients had Down syndrome. All patients had finding of Os Odontoideum on CT scans and three of the five patients had T2 hyperintensity on MRI. Three of the five patients presented with transient neurologic deficits: quadraplegia in two patients and paresthesias in one patient. The patients underwent intra-operative reduction and fixation. C1 lateral mass screws and C2 pedicle screws were placed under fluoroscopic guidance. The subluxation was reduced to attain an anatomical alignment. All patients tolerated the procedure well and were discharged home on post-operative day 4. The patients wore a hard cervical collar and no halo-vests were needed. All patients had solid fusion constructs and normal alignment on post-operative imaging studies performed on average 7 months post-operatively (range: 161 to 302 days).
Conclusions: Harms fusions are a safe and effective method of treating pediatric patients with atlantoaxial instability. Long-term follow-up in these patients demonstrated solid fusion constructs and anatomical alignment in all patients treated.

79. C1 Lateral Mass Screws Incorporated In Occipitocervical And Atlantoaxial Fusions In Children 8 Years Of Age Or Less: A Series Of 6 Patients
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Introduction: We describe the use of C1 lateral mass screws in six children 8 years of age or less, in whom occpitocervical or atlantoaxial fusion was performed for trauma, os odontoideum, or hypoplasia of the dens.
Methods: We retrospectively reviewed the demographics and procedural data of six children, aged 2 years to 7 years, who required and underwent surgical fixation, with a 3- to 9 1/2-month follow-up period.
Results: Although C1-2 screw-rod constructs involving individual C1 lateral mass screws and C2 pars or pedicle screws have been widely applied in adults, little has been reported in children less than the age of 8 years.
Conclusions: We report the results of rigid occipitocervical and atlantoaxial fusion in six children in whom C1 lateral mass screws were placed as part of a screw-rod construct. There was one intraoperative complication of vertebral artery injury, and one delayed complication of O-C1 instability after C1-2 fusion; the lessons learned from these complications are discussed.

80. Failed Age-dependent Maturation Of The Occipital Condyle And C1 Superior Articular Surface May Predict Instability In Down Syndrome: Screening Recommendations

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Introduction: Abnormal flattening of the occipito-atlantal joint has been correlated with cervical spine instability in Down Syndrome patients using computed tomography (CT). The authors evaluated whether the same correlation could be found using measurements of the occipital condyle on plain lateral cervical spine radiographs.

Methods: 39 patients (11 with unstable Down Syndrome, 3 with congenital cervical instability, 25 age-matched controls) underwent plain lateral and flexion/extension radiographs and CT of the cervical spine. Normalized measurements of the occipital condyles were performed on both plain lateral radiographs and CT images.

Results: Comparison of plain lateral radiographs of unstable patients with those of age-matched controls demonstrated mean normalized depth/length ratios of 0.21±0.05 and 0.24±0.05, respectively (P<0.038). Comparison of the occipital condyle measurements obtained using plain lateral cervical spine films with cervical CT images demonstrated a correlation coefficient of 0.63. The curvature of the Oc-C1 joint in age-matched controls increased by 60% from infancy to mid-teenage years.

Conclusions: It appears that Down Syndrome patients who are unstable at Oc-C1 fail to develop the curved architecture to the Oc-C1 joint complex that develops in age-matched controls over time. Plain lateral cervical radiographs are suitable to detect subtle changes in the occipital condyle in Down Syndrome patients that may correlate with instability. Down Syndrome patients who demonstrate abnormal flattening of the occipital condyle with >4 mm of subluxation at Oc-C1 on flexion/extension films should undergo a more comprehensive evaluation; those without gross instability but with flattening of the occipital condyle should undergo yearly screening to assess for the development of instability.

81. Long-term Outcomes And Prognostic Factors In Pediatric Patients With Severe Traumatic Brain Injury And Elevated Intracranial Pressure

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Introduction: The management and outcomes in pediatric patients with elevated ICP and severe TBI are examined here.

Methods: Records from a prospective pediatric trauma database were reviewed to determine interventions for correcting ICPs in patients with severe TBI (GCS<8 and ICP>20 on presentation). Surviving patients were evaluated by the authors to determine functional status and quality of life. Only patients who died, or had greater than 2 years follow-up were included in the study.

Results: Eighty-three patients were identified with severe TBI on presentation. Mean injury severity score was 65 (range, 30-100). ICP control was achieved in 71 patients (86%). Methods employed to achieve ICP control included craniectomy in 29 patients (41%), maximal medical therapy in 25 patients (35%) and ventriculostomy in 17 patients. Ten of the 12 patients (83%) with refractory ICP died. At discharge, 61 patients (75%) were alive. Univariate analysis revealed vascular injury, refractory ICP, and cisternal effacement on presentation to have the highest correlation with brain death (p<0.05). Mean follow-up was 53 monts (range, 11-126 months). Three patients died during the follow-up period (2 infections, 1 suicide). Mean 2-year GOS was 4 (Median 4, range 1-5). Mean patient competency rating at follow-up was 4.13 out of 5 (range 1-4.8). Univariate analysis revealed the extent of intracranial and systemic injuries to have the highest correlation with long-term quality of life (p<0.05).

Conclusions: Controlling ICP elevation is an important factor for survival and quality of life in severe pediatric TBI. The modality used for ICP control appears to be less important.

82. Mechanism Of Central Nervous Injury And Repair Through Epigenetic Phenomena And Modulation Of Dna Methyltransferases

Elias Rizk, MD (Harrisburg, PA); Bermans Iskandar, MD (University of Madison Wisconsin, WI); Brenton Meier III, MD (University of Wisconsin Madison, WI); Nithya Hariharan, MD (University of Madison Wisconsin, WI)

Introduction: We have previously shown that folic acid improves adult mammalian CNS regeneration after injury in a dose-dependent fashion, and that this effect may be mediated by DNA methylation. Here, we confirm this epigenetic phenomenon by examining the effect of CNS injury on the methyltransferase enzymes (DNMTs).

Methods: Adult rats were subjected to a sharp C3 dorsal column injury. Some animals were also given 80 µg/kg of folic acid intraperitoneally. Four days following injury, the spinal cords were homogenized for DNA extraction. Studies were performed on the spinal cord or dorsal root ganglia, including global DNA methylation assays, DNMT RT-PCR and western blot analyses, as well as DNMT activity levels. SAM/SAH ratio calculated to confirm the methylation analyses.

Results: Results show that spinal cord injury causes desaturation of the DNA methylation sites, and that folate supplementation reverses this effect thus normalizing the methylation status of the genes. Furthermore, injury causes a significant decrease in the DNMT mRNA, protein, and activity levels in the spinal cord, all of which are similarly reversed by folate supplementation. Finally, the SAM/SAH ratio decreases in the injured spinal cord, confirming the important role of the main methylation substrate SAM in CNS injury. All results were statistically significant (p<0.05).

Conclusions: The data show that the methyltransferase enzymes are specifically modulated by CNS injury. This lends significant support to our previous hypothesis that a strong relationship exists between DNA methylation and CNS regeneration, and may be an essential mechanism of CNS repair after such injury.

83. The Mandatory All-terrain Vehicle Helmet Law And Its Effect On Traumatic Brain Injury And Helmet Use In West Virginia

Charles L. Rosen, MD; John R. Orphanos, MD; Jamshed A. Zuberi, MD; James C. Helmkamp, PhD; John J. Collins, MD (Morgantown, WV)

Introduction: Effective January 1, 2005, West Virginia passed mandatory all-terrain vehicle (ATV) regulations (WV Code 17F) requiring helmet use for riders less than 18 years of age in response to West Virginia's nation-high ATV-related death rate. This retrospective study examines the impact of that helmet law as well as its effect on traumatic brain injury in the pediatric population of West Virginia.

Methods: ATV-related trauma admission over a seventeen years were retrospectively reviewed (N=339). Pre-law (N=232) and post-law (N=107) pediatric populations were evaluated for helmet use, traumatic brain injury severity, Glasgow Coma Scale (GCS) on admission, and length of stay (LOS) in the ICU.

Results: Pre-law data confirmed helmet use of 26.7%. Post-law data confirmed helmet use of 42.9%. 87.5% of pre-law patients suffered mild head injury (miHI, GCS 13-15), 2.15% moderate head injury (moHI, GCS 9-12), and 10.3% severe head injury (sevHI, GCS 3-8). 95.3% of post-law patients suffered miHI, 0.93% moHI, and 3.73% sevHI. The average GCS for pre-law patients was 13.7 and post-law was 14.5. The average ICU LOS for pre-law patients was 1.2 days and 0.78 days for post-law patients.

Conclusions: Post-law helmet use has increased from 26.7% to 42.9% as a consequence of this legislation. Unfortunately, over half of all accidents occurred in non-helmeted riders. The incidence of modHI and sevHI has decreased in the post-law era. Compliance is a central issue to the helmet law, but positive trends in injury severity may encourage legislation to require helmet use for ATV riders of all ages in West Virginia.

84. The Effect Of Pulsatile Cerebrospinal Fluid Flow On Astrocytic Growth On Polymer-coated Silicone Catheters

Carolyn A. Black, BS (Salt Lake City, UT); William E. Grever, PhD; N.K. Simon Ng, PhD (Detroit, MI); James Resau, PhD (Grand Rapids, MI); James P. (Pat) McAllister, PhD (Salt Lake City, UT)

Introduction: While silicone catheters have vastly improved an array of medical treatments, reactions at the tissue-substrate interface often impede their functionality. Shunt catheters often become obstructed because an interface attractive to astrocytes is created. In this study, the hydrophobicity of silicone catheters was modified with polymer coatings and investigated in an in vitro model of cerebrospinal fluid flow through a catheter.

Methods: Using a pulsatile flow apparatus at 0.3 mL/min, 3 x 106 astrocytes (46,153 astrocytes/mL) were exposed to the lumen of native medical grade (with a hydrophobic contact angle measurement of 107.4°) and oxidated silicone (with a hydrophilic contact angle measurement of 0°), OD 2.5 mm and ID 1.3 mm.

Results: The observed trend in this fluidic culture study was an astrocytic preference toward the native medical grade silicone when samples were held horizontally and a preference toward oxidated silicone when samples were held vertically. A significant difference (p<0.05) between native medical grade and oxidated silicone was observed in the bottom half of the

horizontal tubing, a region prone to astrocytic settling. When compared to standard cell culture preparations of astrocytes on silicone, these results are noticeably dissimilar.
Conclusions: The results of this study provide a better understanding of the effects of pulsatile flow on astrocytic growth and thus lead to the identification of novel surface modification strategies to reduce astrocytic obstruction and improve long-term implantation of shunt catheters.

85. Pathogenesis And Treatment Of Intracranial Arachnoid Cysts In Pediatric Patients Younger Than 2 Years Of Age
Gabriel Zada, MD; Mark Krieger, MD; Sean McNatt, MD; Ira Bowen, MD; J. Gordon McComb, MD (Los Angeles, CA)
Introduction: Arachnoid cysts can cause a variety of clinical signs and symptoms. We sought to determine whether the clinical presentation of patients younger than 2 years old and harboring arachnoid cysts influenced the type of intervention that would be required.
Methods: A retrospective chart review was conducted for all patients younger than 2 years of age who had undergone craniotomy for fenestration of an arachnoid cyst at the Childrens Hospital Los Angeles between 1995 and 2006.
Results: Forty-two patients were included in the study. The mean age was 10.4 months. The median follow-up time was 33 months. Clinical presentations were as follows: macrocephaly without ventriculomegaly (21 patients, 50%), hydrocephalus (six patients, 14%), and other symptoms (15 patients, 36%). After fenestration of the arachnoid cyst, 12 of 21 patients (57%) presenting with nonspecific macrocephaly required placement of a cystoperitoneal or ventriculoperitoneal shunt, compared with 1 of 15 patients (7%) presenting with other symptoms (p value = 0.0039). Five of six patients with hydrocephalus (83%) were shunt dependent following fenestration. Overall, 18 of 42 patients (43%) were shunt dependent after fenestration. Ten of these patients (55%) required revisions during the follow-up period.
Conclusions: Patients younger than 2 years of age with an arachnoid cyst commonly present with macrocephaly. These patients are more likely to require shunts than are those presenting with other findings. The development and expansion of arachnoid cysts may be related to aberrant cerebrospinal fluid dynamics. Arachnoid cysts should be treated with craniotomy and cyst fenestration, taking into account the likelihood of perioperative shunt dependency.

86. Nitrous Oxide Inhibits Neuronal Regeneration In Vitro
Kirk Hogan, MD; Brenton Meier, BS; Bermans Iskandar, MD; Nithya Hariharan, MD (Madison, WI); Elias Rizk, MD (Penn State University, PA)
Introduction: Nitrous oxide, a folate enzyme (methionine synthase) inhibitor, is used liberally as a general anesthetic. Since we have previously shown that folate is important in recovery after CNS injury, and concerns were raised regarding subtle, deleterious effects of anesthetics on the CNS, we chose to study the effect of N2O on neuronal regrowth after injury.
Methods: Sprague-Dawley rats were subjected to a transection of both dorsal columns and one sciatic nerve. Half the rats were exposed to 80%N2O/20%O2 for 4-hours. The lumbar DRGs were removed at various time intervals afterward. Individual neurons were cultured and labeled with Beta-III-tubulin-fluorescent antibody. Axonal elongation was assessed blindly using ImageJ software.
Results: Injury to the spinal component of DRG neurons produced long axons in 10% of cells at 24 hours. Furthermore, a pre-conditioning injury to the sciatic component enhanced the neuronsâ™ regener ative capacity(10% to 30%). N2O exposure suppressed the neuronsâ™ elongation following spinal cord injury (10% to <1%), unless preconditioned with a sciatic lesion. When methionine synthase activity was allowed to recover, the neurons displayed an intermediate(5%) regenerative capacity, confirming the mechanism of action of N2O($p<0.05$).
Conclusions: N2O exposure inhibits neuronal regeneration in vitro unless preconditioned with a sciatic injury. This confirms our hypothesis that the mechanism of action of folate is distinct from the pro-regenerative effect of a peripheral nerve injury. Importantly, the dose and duration used here reproduces intraoperative exposures in humans. Such an effect, if confirmed in humans, would greatly impact the anesthetic use in neurosurgery.

87. Expression Of Netrin-4 And Its Receptors After Hypoxic Ischemic Injury To The Neonatal Brain
Jason Liauw, BS; Stanley Hoang, BS; Matt Choi, BS; Mariya Kalashnikova, BS; Alexis Davis, MD; Michael Edwards, MD; Gary Steinberg, MD, PhD; Raphael Guzman, MD (Stanford, CA)
Introduction: Functional recovery following an ischemic insult in the neonatal brain is governed by a series of mechanisms that result in the induction of axonal outgrowth, the restoration of synaptic architecture, and the regeneration of vascular networks. Netrin-4 is an extracellular molecule expressed widely in the neonatal brain and has recently been implicated in neurite outgrowth and angiogenesis during development. This dual function of netrin-4 suggests that it may also be important for promoting plasticity and subsequent functional recovery following neonatal cerebral ischemia. In this study, we investigate the expression of netrin-4 and its receptors, DCC and UNC5H1, following a hypoxic-ischemic (HI) model of stroke in neonatal rats.
Methods: Neonatal rats (P7) underwent unilateral common carotid artery occlusion followed by HI (8% O2) for 2.5hours. At 72 hours after stroke the animals were sacrificed and processed for immunohistochemistry including netrin-4, DCC, UNC5, GFAP and b-tubulin.
Results: Netrin-4 is unilaterally upregulated in the ischemic hemisphere 72 hours following HI. Moreover, Netrin-4 protein expression colocalizes with both GFAP positive reactive astrocytes and dilated blood vessels within the ischemic hemisphere. Netrin upregulation was not seen in sham-operated controls. Netrin-4 receptor expression was seen bilaterally 72hrs post HI. DCC expression is found to colocalize with b-tubulin on processes of immature neurons while UNC5 expression is localized to neuronal cell bodies.
Conclusions: Our results suggest that netrin-4, by participating in both blood vessel and nerve regeneration, may serve as a promising agent in the search for therapeutic means to improve functional recovery after ischemic insult to the neonatal brain.

88. Hyperdynamic Pulsatile Flow And Ventricular Dilation In Experimental Communicating Hydrocephalus
Marion L. Walker, MD; James P. (Pat) McAllister, PhD (Salt Lake City, UT); Mark Haacke, PhD (Detroit, MI); Helene Benveniste, MD, PhD (Upton, NY); Michael R. Egnor, MD (Stony Brook, NY); Yimin Shen, PhD (Detroit, MI); Shams Rashid, BA (Stony Brook, NY); Jie Li, MD (Detroit, MI); Mark E. Wagshul, PhD (Stony Brook, NY)
Introduction: In communicating hydrocephalus (CH), explanations for symptoms and effective treatments have been elusive. While it is known that pulsatile flow through the cerebral aqueduct is often elevated in hydrocephalus, a clear link between abnormal pulsations and ventriculomegaly has yet to be established. The purpose of this study was to characterize the temporal changes in intracranial pulsatility in a novel model of CH.
Methods: Kaolin (25%) was injected into the basal cisterns (n=8) in adult rats and 1, 2, 8, 15, and 31 days later animals were scanned on a 9.4 Tesla magnet. Ventricular volume was based on CSF-bright 3D-TrueFISP images and aqueductal flow was assessed using a gradient echo phase contrast sequence.
Results: Two distinct patterns developed: (1) 4 animals developed severe ventriculomegaly which progressed steadily; aqueductal pulsations were significantly elevated and increased with time in correlation with ventricular volume ($R2 = 0.75$, $p < 0.0001$). Ventricular volumes and pulsations increased to approximately 10 and 30 times normal, respectively. (2) 2 animals developed mild ventriculomegaly which changed very little after day 1. Aqueductal pulsations increased on day 1 and remained so until day 15, where-upon they returned to control levels and remained low. Before day 15, ventricular volumes and pulsations increased to approximately 3 and 6 times normal, respectively.
Conclusions: Severe ventriculomegaly in basal cistern-induced CH is associated with an immediate change in ventricular CSF pulsatility. However, in mildly hydrocephalic animals this relationship is not strictly held. The late drop in pulsatility may indicate a compensatory mechanism to control progressive ventriculomegaly.

89. Shunt Disconnection Or Fracture: Treatment Alternatives In Symptomatic And Asymptomatic Patients
Maria Lamberti-Pasculli, RN; James Drake, MB (Canada, The Hospital for Sick Children, Toronto); Kemel A. Ghotme Ghotme, MD (Canada, Toronto); James Rutka, MD, PhD (Canada, The Hospital for Sick Children, Toronto)
Introduction: A probability of occurrence of shunt malfunction of 81% at 12 years of follow-up has been reported in multicentric studies. Broken shunts might be responsible of 13.6% of malfunction cases. The present study intends to identify clinical or paraclinical factors to be considered to decide revision or observation of patients with broken shunts, main therapeutic alternatives used in symptomatic and asymptomatic patients, as well as their results.
Methods: A descriptive retrospective study is performed. Total number of shunt malfunctions from January 1990 to June 2007 and percentage of broken shunts were quantified and analyzed. Asymptomatic patients diagnosed in outpatient clinic were also included. Data were processed using SPSS. P value was determined.
Results: From a total of 2232 patients with shunt malfunction, (excluding

infections) during the study period, shunt disconnection or fracture was diagnosed in 360 cases (16%). Treatment was specified for symptomatic and asymptomatic patients and results were assessed in terms of good outcome, morbidity and mortality. Complete data are currently in process.
Conclusions: Shunt disconnections or fractures are a common problem in patients with VP shunts. If raised intracranial pressure or neurological deterioration is evident, a decision to revise the shunt can be made without hesitation. Conversely, in asymptomatic patients or those in which there is no certainty of malfunction because of the presence of patent fibrous tracts, opportune and appropriate treatment might be delayed, leading to increased morbidity or mortality. Algorithm to address appropriate treatment of broken shunts is proposed and revision of legal aspects will be included during discussion.

90. Validation Of A Noninvasive Test Of Csf Shunt Function
Sherman C. Stein, MD; Frederick J. Fritz, BS, MBA; Marek Swoboda, PhD; Brian Lind (Philadelphia, PA)
Introduction: We lack a single diagnostic test which can reliably assure that a CSF shunt is functioning. This study evaluates a noninvasive, self-contained device to confirm flow in shunts.
Methods: The device (ShuntCheck®) uses transcutaneous thermal convection to measure flow through subcutaneous shunt tubing. An ice cube (or crushed ice) is applied proximally for several seconds, and the distal temperature change is measured. The higher the flow rate, the greater the temperature drop recorded by the sensors. An algorithm based on in vitro responses calculates flow rate. The authors tested the device in four pigs of various ages and skin thicknesses, using a constant infusion pump and subcutaneous shunt tubing. Flow rates of 0 to 20 ml/hr were used.
Results: There was close agreement between the flow rates and the amplitude of temperature drop recorded by the thermal sensors. The relationship is highly linear at flow rates above 3 ml/hr (0.07 ml/min). The correlation coefficient between actual and measured flow rates (r2) is 0.94-.97 for individual pigs and 0.88 when measurements from all four pigs were pooled.
Conclusions: ShuntCheck appears to be a reliable way to measure flow in CSF shunts. The use of this device may help to diagnose or to rule out shunt malfunction. Preliminary results of confirmatory experiments in shunted patients will be discussed.

91. Ventriculo-peritoneal Shunt Infection Rates: Reaching For 0
Eric R. Trumble (Orlando, FL)
Introduction: Ventriculo-peritoneal shunt infections are a common infectious complication. In 2003, the Orlando pediatric ventriculo-peritoneal shunt infection rate of 8.6% was slightly above the national average. In an effort to reduce the infection rate, a protocol was introduced for all shunt surgeries.
Methods: A single surgeon covering the 3rd largest NICU in the nation(with >1200 NICU discharges in 2006) prospectively gathered data on all shunt implants. Protocol consisted of: 1. Minimizing surgical personnel in the OR(<4 preferred) 2. Eliminating use of surgical assistant 3. Minimizing surgical time(<15 minutes preferred) 4. Using anti-biotic impregnated shunts 5. Minimizing use of programmable valves 6. Performing shunts with neuro team, as a first case. We followed all shunts for a minimum of 6 months, and defined a shunt infection as a positive CSF culture. Variables such as patient age, number of shunt operations, length of stay, concomitant medical diagnoses, etc were analyzed.
Results: The infection rate at Arnold Palmer Hospital dropped from 8.6% in 2003 to 1.8% in 2006, while other variables usually associated with increased infection risk, e.g. younger patient age, more complex medical issues/diagnoses, trended toward higher risk. The only infection in 2006 was in a patient with >100 previous shunt operations, whose skin broke down leading to the development of a candidal shunt infection.
Conclusions: With adherence to a strict protocol, <2% is an attainable goal in terms of ventriculo-peritoneal shunt infection rates. Physicians must be at the forefront of assessing appropriate protocols to be used for analysis in outcomes based medicine.

92. Lumboperitoneal Shunting In Children With Ventriculoperitoneal Shunts And Acquired Raised Intracranial Pressure
Christopher A. Gegg, MD; Greg Olavarria, MD; Jogi V. Pattisapu, MD (Orlando, FL)
Introduction: We present five cases of children with ventriculoperitoneal shunts who had multiple shunt revisions with signs and symptoms of raised intracranial pressure and small, static ventricles. They were treated using intracranial pressure monitoring and finally lumboperitoneal shunting with resolution of symptoms.
Methods: A case study/chart review of five children treated at two institutions with initial presentations of hydrocephalus (congenital (2), achondroplasia, Pfeiffers, post-hemorrhagic) shunted early in life, all had large ventricles (avg. ages at implant 3 months). Each developed signs and symptoms of shunt malfunction (avg. onset 7 yrs. after initial shunt) with multiple revisions within a short period of time (avg. 4 revisions within 3 months time) and small, static ventricles. All presented with headache, vomiting, and altered mental status (two with papilledema). Intracranial pressure monitoring demonstrated high pressures (range 35-55) and lumboperitoneal shunts were placed (Spetzler slit-end type) with or without intervening antisiphon programmable valves, while ICP was monitored.
Results: Two children had their ventriculoperitoneal shunts removed. The resolution of symptoms was immediate in all patients with rapid normalization of ICP. Follow up times range 3 - 12 months with persistent absence of symptoms in all.
Conclusions: We conclude that children with small, poorly compliant shunted ventricles who present with signs of raised intracranial pressure respond well to lumboperitoneal shunting. When shunt revisions fail to offer patients relief, and a functional shunt has been demonstrated, pediatric neurosurgeons should consider intracranial pressure monitoring and lumboperitoneal shunt insertion as a treatment alternative in these difficult patients.

93. First Experiences With An Adjustable Gravity-assisted Valve In Childhood Hydrocephalus
Veit Rohde (Germany, Goettingen)
Introduction: CSF overdrainage is the source of complications after ventriculoperitoneal shunting with differential-pressure valves. Recently, an adjustable gravity-assisted valve (ProGAV) had been developed to overcome overdrainage problems. Up to now, ProGAV only had been used in adult hydrocephalus. Therefore, we are encouraged to present our initial experiences with ProGAV in children.
Methods: The ProGAV was used in 27 children aged between 0.1 and 17 years with various types of hydrocephalus. In 10 children, the ProGAV was placed as part of a re-operation for shunt failure. In the majority of children, the initial opening pressure of the adjustable unit of ProGAV was set to 5 or 6 cm H20 (n=15). For the gravity unit, an opening pressure of 20 cmH20 (n=23) was mainly chosen.
Results: The mean follow-up period was 15 months (range 1 to 29 months). There were no valve-related complications, but two infections (7 %), making shunt removal necessary. In 5 children, the opening pressure was changed during the follow-up period, in 4 children due to overdrainage symptoms and in 1 child due to assumed underdrainage. Opening pressure changes resulted in improved clinical performance, but one child with overdrainage still complained about intermittent position-related headache despite the maximum opening pressure. Overall, satisfactory clinical results could be obtained in 25 of 27 children.
Conclusions: This is the first series of childhood hydrocephalus treated with an adjustable gravity-assisted valve. Our initial results are encouraging. A success rate of > 90 % is high, but the comparatively short follow-up period has to be kept in mind.

94. Laparoscopic Placement of Distal Shunts
Brian P. Callahan, MD; Michael H. Handler, MD, FACS (Aurora, CO)
Introduction: Background: Ventriculoperitoneal shunts (VPS) are commonly placed into the peritoneal cavity via a small laparotomy or blindly by using a split trocar. Larger patients require larger incisions, and are made more difficult by previous abdominal operations and obesity. Laparoscopy has become the approach of first choice for abdominal procedures by general surgeons, using one or several very small incisions. We present our pediatric series of cases using laparoscopy to place the distal shunt catheters.
Methods: We reviewed the medical records over 9 years, noting VPS operations performed using laparoscopy. Complications, morbidity, and alterations of planned management were noted.
Results: 137 VPS operations on 126 patients were identified, 92 by the senior author alone, and 45 with the assistance of a general surgeon. A second port was placed for lysis of adhesions or retrieval of old catheters in 7 cases. There were no immediate complications. The infection rate was 6.7%, comparable to the institutional norm over an 8 year period of 6.3%. There were two early failures due to abdominal malabsorption without infection. Two catheters later broke at the level of introduction into the abdomen due to shearing by the abdominal trocar.
Conclusions: Laparoscopic placement of distal VPS catheters is safe and allows insertion via inconspicuous incisions.. It can allow for inspection or

lysis of adhesions and removal of foreign bodies, help determine if and where the abdomen can absorb shunt fluid, and make VPS surgery in the obese easier.

95. Neuroendoscopic Laser Assisted Cystoventriculostomy And Ventriculocysternostomy Using A Recently Developed 2.0 Micron Fiber Guided Laser In Children With Hydrocephalus

Hans C. Ludwig, MD; Thorsten Knobloch, MD (Germany, Goettingen); Kevin Rostasy, MD (Austria, Innsbruck); Veit Rohde, MD (Germany, Goettingen)

Introduction: Preterm infants have a high incidence of posthemorrhagic or postinfectious hydrocephalus often associated with ventricular or arachnoic cysts and the risk of entrapment of cerebrospinal fluid (CSF). In these cases fenestration and opening of windows within separating membranes are possible neurosurgical therapy options. Although Nd:YAG- and diode-lasers have been already used in neuroendoscopical procedures, neurosurgeons avoid these lasers in proximity to vital structures because of potential side effects.
Methods: We have used a recently available laser (RevolixTM LISA laser products, Katlenburg, Germany). The laser wavelength is 2.0 micron, which can be delivered through silica fibers towards endoscopic targets. From 2002 until 2007 70 endoscopic procedures in 68 patients were performed. 50 patients were children and young adults. Their mean age was 22 years,18 of the patients were under one year old. Most children suffered from complex posthaemorrhagic and postinfectious hydrocephalus, in which shunt devices failed due to entrapment.We used two different rigid endoscopes, a 6 mm and 3 mm Neuroendoscope (Braun Aesculap, Melsungen, Germany). The laser beam (5-10 Watt continuous wave) was conducted through a 365 micron bare silica fiber introduced through the endoscope`s working channel.
Results: All patients tolerated the procedure well. No immediate or longterm side effects were noted. In ETV procedures all but one patient had a sufficient stoma. In patients with complex multicystic hydrocephalus several shunts could be avoided or a single catheter shunt could be inserted.
Conclusions: The authors conclude that the use of the new RevolixTM laser enables safe and effective procedures in neuroendoscopy even in young children.

96. Can Prenatal Mri Predict The Need For Postnatal Ventricular Shunting?

Robert Delapaz, MD (New York City, NY); Peter Kan, MD, MPH (Salt Lake City, UT); Sherelle Laifer-Narin, MD; Neil A. Feldstein, MD; Richard CE Anderson, MD; Monique Vanaman, BA (New York City, NY)

Introduction: The outcome of children with prenatal ventriculomegaly varies widely, making prenatal neurosurgical counseling difficult in many cases. The purpose of this study was to determine whether variables present on prenatal MRI were associated with the need for postnatal shunting.
Methods: Pregnancies complicated by prenatal ventriculomegaly at Columbia University from 1998 to 2007 were retrospectively reviewed. Only children with prenatal MRI and postnatal imaging (MRI, U/S, CT) were included. Variables examined included ventricular size, unilateral or bilateral ventriculomegaly, presence of additional CNS anomalies, gestational age at the time of prenatal MRI, sex, and time between prenatal and postnatal imaging.
Results: Of 39 patients included in the study, 6 required postnatal shunting. Ventricular size had a significant effect on the need for shunting in children with both isolated ventriculomegaly (p=.021) and ventriculomegaly with other CNS anomalies (p=.018). All six patients who underwent shunt placement had ventricles at least 20mm on prenatal MRI. Of 8 patients in the study with ventricles larger than 20mm, 6 (75%) underwent shunting. Gestational age (p = .3), the number of days that elapsed between pre- and postnatal imaging (p = .6), sex of the fetus (p = .4), and laterality of ventriculomegaly (p = .07) did not significantly affect the need for shunting.
Conclusions: Prenatal ventricular size seems to be associated with the need for postnatal ventricular shunting. In our study, patients with ventricles larger than 20mm underwent postnatal shunt placement 75% of the time. No patients with ventricles smaller than 20mm had a shunt placed.

97. The Cavum Septi Pellucidi: Implications For Endoscopic Surgery Of The Third Ventricle

Mark M. Souweidane, MD; Caitlin E. Hoffman, MD; Theodore H. Schwartz, MD (New York, NY)

Introduction: The expanding role of endoscopic surgery warrants a careful assessment of the various techniques as it relates to anatomical variants. Due to the common occurrence of the cavum septi pellucidi, the endoscopic surgeon should be familiar with the relevant intraventricular anatomy and the implications for third ventricular surgery.
Methods: From a prospective database, cases were selected in which in addition to the defined pathology a coexistent cavum septi pellucidi was present. Pertinent radiographs, operative notes, and archived video files were reviewed to define the pertinent internal anatomy of the cava and resultant surgical modifications.
Results: Five patients with noncommunicating hydrocephalus (3 colloid cyst, 1 pineal region tumor, 1 quadrigemminal plate lipoma) underwent endsocopic third ventricular surgery through a cavum septi pellucidi. Stereotactic guidance for a parasagittal intraseptal entry was used rather than a standard coronal route into the frontal horn of the lateral ventricle. Since a transforaminal route was not possible, access into the third ventricle was accomplished between the postcommissural fornix fibers anterior to the foramina of Monro and the pstalterium, and posterior to the anterior commissure. The surgical goal was met in each case without any morbidity.
Conclusions: Familiarity with the anatomical variant of a cavum septi pellucidi is essential for safe third ventricular endoscopic surgery. Relevant internal anatomy at the base of the cavum includes the anterior commissure, the postcommissural fornix, and the psalterium. A safe endoscopic route into the third ventricle is defined posterior to the anterior commissure between the postcommissural fornix fibers.

98. Shunt Infections - A Plague Of The Past?

Silvia Gatscher, MD (United Kingdom, London)

Introduction: Shunt infections are still a major cause of shunt-related morbidity. Recent data indicate that antibiotic-impregnated catheters reduce shunt infection rates significantly. In this study, the authors collected shunt data prospectively and evaluated the shunt infection rate before and after the introduction of antibiotic-impregnated catheters.
Methods: Between June 2005 and June 2006 all patients aged 0-6y undergoing a shunt procedure had antibiotic-impregnated catheters (Rifampicin&Clindamycin) implanted. After a data review, antibiotic-impregnated catheters were used in all patients, aged 0-16y, since July 2006.
Results: 1024 patients underwent 1592 shunt procedures with non-impregnated catheters between 1993 and 2003. 114 children suffered 133 shunt infections (8.4%), with a shunt infection rate of 12.9% in the <6m and 9.96% in the 0-6y group. Between June 2005 and June 2006, 92 shunt procedures were performed with a shunt infection rate of 2.17%. There were no infections in the <6m age group. In July 2007 the shunt infection rate for a total of 221 shunt operations was 3.62%. 2 infections were secondary to coagulase-negative staphylococcus, resistant to rifampicin.
Conclusions: In this study, the introduction of antibiotic-impregnated catheters reduced the shunt infection rate from 8.4% to 3.62% in the 0-6y and from 12.9% to 1.98% in the <6m group. The occurence of a rifampicin resistent staph in 2 patients is significant and needs to be monitored.

99. Osmolarity Predicts Ventricular Volume In Experimental Hydrocephalus

Satish Krishnamurthy, MD (Detroit, MI); Jie Li; Yimin Shen; James P. McAllister, PhD (Wayne State University, Detroit, MI)

Introduction: Contemporary theories suggest that hydrocephalus is a result of a disordered cerebrospinal fluid circulation. However, a few papers suggest that osmotic gradients play a role in the pathogenesis. This study was undertaken to examine the role of osmolarity in hydrocephalus.
Methods: Intraventricular cannulae connected to subcutaneous Alzet minipumps were inserted into the lateral ventricle in four groups of adult Sprague Dawley rats: Group I (artificial CSF, negative control), group II (FGF-2, positive control), group III (10 KD Dextran, experimental) and group IV (40KD Dextran, experimental). MRI scans were performed on the 12th day of infusion to measure the ventricular volume prior to euthanasia.
Results: Group I had no hydrocephalus (n=3). Group II (n=4), group III (n=3) and group IV (n=2) animals exhibited significant ventriculomegaly compared to group I ($p<0.05$). Ventriculomegaly in group IV was less compared to groups II and III. Mean osmolarity of the fluid infused was 307, 337 and 328 mOsm/L in Groups I, III and IV, respectively, and correlated with ventricular size ($r2= 0.9656$). None of the animals with hydrocephalus had obstruction of the aqueduct. We anticipate completion of at least 10 animals in the experimental groups prior to presentation.
Conclusions: The presence and degree of dilatation of the lateral ventricles in these experiments were related to the osmolarity of the fluid infused. Although these results are preliminary, the findings prompt a re-thinking the role of osmotic gradients in the genesis of hydrocephalus.

101. Withdrawn

102. Giant Cell Poorly Differentiated Myxopapillary Ependymoma.
Martin E. Weinand, MD; L. Philip Carter, MD; Rachit Kumar, MD; Namath S. Hussain, MD (Tucson, AZ)

103. Minimally Invasive Surgical Treatment Of Pseudocyst-induced Syringomyelia
Wesley Whitson, BS; Edward J. Kosnik, MD; Chris S. Karas, MD (Columbus, OH)

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102. Giant Cell Poorly Differentiated Myxopapillary Ependymoma.
Martin E. Weinand, MD; L. Philip Carter, MD; Rachit Kumar, MD; Namath S. Hussain, MD (Tucson, AZ)
Introduction: The most common cause of neoplastic intradural spinal mass lesions is metastatic disease, followed by primary central nervous system tumors. Ependymoma is an uncommon cause of spinal mass lesions. Giant cell poorly differentiated myxopapillary ependymoma is exceedingly rare and late recurrence of the disease has not been previously reported.
Methods: We describe a case of a twenty-three year old woman with a known history of spinal ependymoma resected in Greece fourteen years ago with postoperative and surveillance imaging revealing gross total resection. The patient developed back pain six months ago, and a repeat MRI revealed that she had five spinal lesions with the largest in the lumbosacral spine. Preoperative and postoperative scanning, along with pathological slides from her present surgery and her previous surgery in Greece are reviewed.
Results: The patient presented with a subacute onset of bilateral lower extremity weakness and parasthesias. The differential diagnosis based on the patient's history and imaging studies included recurrent ependymoma, metastasis, and primary glioma. The patient was taken to the operating room for resection of the largest mass with intraoperative frozen section revealing giant cell poorly differentiated myxopapillary ependymoma with perivascular rosettes and giant cells. Notably, there was no evidence of neovascularity, mitotic figures, or necrosis. The patient's lower extremity weakness resolved in the immediate postoperative period, and she was discharged to home with instructions regarding surveillance imaging.
Conclusions: Giant cell spinal cord ependymomas are rare with few primary cases reported in the literature. We report a case of giant cell ependymoma recurrence fourteen years after resection.

103. Minimally Invasive Surgical Treatment Of Pseudocyst-induced Syringomyelia
Wesley Whitson, BS; Edward J. Kosnik, MD; Chris S. Karas, MD (Columbus, OH)
Introduction: Syringomyelia is frequently associated with foramen magnum lesions, especially Chiari malformations. This case illustrates the dynamic relationship between cerebrospinal fluid flow, the cerebellum, and the spinal cord.
Methods: A fifteen year-old female with a history of myelomeningocele, Chiari II, and ventriculoperitoneal (VP) shunt presented with numbness and tingling in both hands and mild weakness in both arms. Examination for shunt malfunction revealed an abdominal pseudocyst., with subsequent hydrocephalus. Also, magnetic resonance images revealed a newly diagnosed holocord syrinx. Presumably, these were pseudocyst-induced hydrodynamic changes. The patient underwent laparoscopic repositioning of the peritoneal catheter to a new intraperitoneal location outside the pseudocyst, with evidence of brisk flow prior to removal of the laparoscope.
Results: The patient's hydrocephalus quickly resolved. Additionally, her syrinx significantly decreased in size on images taken two weeks after this procedure. Presenting symptoms likewise improved. Extent of hindbrain descent remained stable.
Conclusions: Treatment of hydrocephalus has been shown to reduce both syringes and hindbrain herniation and to improve symptoms. In this case, shunted congenital hydrocephalus was exacerbated by extracranial pathology, the laparoscopic treatment of which resulted not only in alleviation of elevated intracranial pressure, but in partial regression of extensive syringomyelia as well. CSF flow dynamics affecting the ventricular system were translated to the entire spine both in the formation and resolution of a symptomatic syrinx. Fortunately, multiple serious abnormalities were addressed with minimal intervention and this patient is unlikely to face the same complications again, as pseudocyst recurrence is rare.

104. Hydrocephalus In The Developing World: A Personal, Operative Experience
Chris S. Karas, MD (Columbus, OH)
Introduction: The approach to hydrocephalus and other congenital disorders of the central nervous system has recently changed significantly in Kenya and surrounding countries. Traditionally, the associated chronic medical and rehabilitation needs even after surgical intervention were more than the medical system could bear both financially and in human resources.
Methods: 2 weeks were spent operating independently as a pediatric neurosurgeon in Kijabi, Kenya. An investigation was then performed to discover the development of pediatric neurosurgery in Eastern Africa, with emphasis not only on public heath, but individual contributions as well.
Results: Despite limited resources both in prevention of congenital hydrocephalus and its treatment, significant advances in the complex care of these patients have been made. These changes are arising through education of both the general population and the medical community regarding dietary changes, prenatal care, surgical technique and associated disorders (such as myelomeningocele).
Conclusions: It is clear that the ideology in Eastern Africa is changing to one which regards congenital hydrocephalus as treatable. Through improved medical training, public health interventions, and the willingness of surgeons to treat this population of patients, pediatric neurosurgery and rehabilitation are evolving rapidly.

105. Quantitative Analysis Of Web-based Information Regarding Hydrocephalus
Abhishek Julka, BS; Chris S. Karas, MD; Courtney Kauh, MS; Mirza Baig, MD, PhD (Columbus, OH)
Introduction: False sources of information often lead to misconceptions that impair physician-patient communication and thereby interrupt shared decision making. The objective of this study is to evaluate the internet as a resource for pediatric patients with hydrocephalus.
Methods: Using the most popular internet search engines we conducted a study of web-based literature. Overall, 50 sites focused on pediatric hydrocephalus were evaluated with the exclusion of scholarly papers and advertisements. Web site ownership, author credentials, degree of objectivity, current relevance, and content quality were recorded and assessed by comparing the sites to textbooks and reliable published articles acquired through Pubmed and Medline. The DISCERN scale was used to quantitatively evaluate the quality of the sources in their presentation of all aspects of the disease process and treatment options. This scale has been proven effective in analysis of published medical information in other specialties.
Results: Although many web sites were found to be dependable, large amounts of unreliable information was discovered and quantified as well. These sites received similar DISCERN scores when evaluated by either resident neurosurgeons or non-health care professionals. This scale enables surgeons to objectively evaluate their patients' sources of published information.
Conclusions: In the quickly growing web savvy patient population it is useful for physicians to understand the scope of knowledge a patient possesses. After examining the many resources available to the public and dedicated to hydrocephalus on the internet, it is clear that these sites are powerful tools for informing patients and their families if used appropriately and validated periodically.

106. Monte Carlo Simulation Of Cerebrospinal Fluid Shunt Failure
Joseph H. Piatt Jr., MD (Philadelphia, PA); Margaret P. Cosgriff (Swarthmore College, Swarthmore, PA)
Introduction: To estimate the number of operations that a patient with hydrocephalus will require within 10 years of diagnosis based upon published survival data for cerebrospinal fluid (CSF) shunts.
Methods: Survival data for CSF shunts from several previously published sources were formatted as life-tables spanning a 10-year period in monthly intervals. The monthly sequence of fractions of shunts failing was taken as the basis for a Monte Carlo simulation. Month by month for every virtual patient the computer simulation called up a random number between 0 and 1. If the random number was greater than the fraction of shunts failing in that monthly interval, the shunt survived. If the random number was less than or equal to the fraction of shunts failing in that interval, the shunt failed. When the virtual patient's shunt failed, the patient returned to the first interval in the life-table and began again. For every virtual patient this process continued for 120 months, and the shunt operations were counted. Expected numbers of shunt operations were calculated, as were 95th and 99th percentiles.
Results: Four sources of CSF shunt survival data were employed. Expected numbers of shunt operations ranged between 2.43 and 3.93 over 10 years. Estimated 95th percentiles ranged between 5 and 11. Estimated 99th percentiles ranged between 8 and 15.

Conclusions: These simulations may be useful in counseling patients and families. The Monte Carlo methodology also allows objective definition of outliers - unstable patients who seem to have experienced more than ordinary bad luck - for future study.

107. Intracavitary Bleomycin Plus Staged Multi-trajectory Surgery For A Giant Mixed Solid And Cystic Pediatric Craniopharyngioma

John J. Collins, MD, FACS (Morgantown, WV); Frank Keller, MD, FACS (Atlanta, GA); Takanori Fukushima, MD (Morgantown, WV)

Introduction: Craniopharyngioma constitutes approximately 6%-9% of all intracranial pediatric tumors and can lead to serious morbidities or even death because of close proximity to critical structures. The best management in childhood remains controversial, but any strategy must avoid treatment morbidities while assuring survival and preventing recurrence.

Methods: This case report of an eleven year-old girl with a massive cystic and solid craniopharyngioma, describes an alternative strategy to reduce morbidity without abandoning the goal of eventual complete tumor excision. We achieved radiographically complete tumor removal as the final endpoint after a series of management stages that combined intracavitary Bleomycin injection followed by gamma knife radiosurgery and two different trajectories of surgical approach.

Results: Intracavitary Bleomycin dramatically reduced the size of the large frontal tumor cyst and stimulated the formation of a discreet enhancing tumor capsule. Gamma knife radiosurgery failed to prevent tumor cyst recurrence during the time interval between the two surgical stages. The use of two different surgical trajectories assured that every portion of the tumor capsule underwent removal by optimal direct microsurgical visualization. This enabled complete tumor removal, as determined by post-operative MRI, without producing new neurologic deficit and led to subsequent improvement in behavioral and neurocognitive function with weight gain remaining less than the 98th percentile. Partial hypopituitarism, however, did occur.

Conclusions: We propose that in cases of large mixed solid and cystic craniopharyngiomas, tumor removal with lower morbidity may result from a multimodality strategy that includes intracystic Bleomycin followed by staged, multi-trajectory surgical excisions. Gamma knife radiosurgery, however, may not add benefit.

108. Withdrawn

109. Suprasellar Mixed Malignant Germ Cell Tumor: Case Report And Review Of The Literature

Chris S. Karas, MD; Robert Hirschl, MD; Scott W. Elton, MD (Columbus, OH)

Introduction: Germ cell tumors comprise fewer than 5% of tumors of the CNS in the United States. Multiple modalities have been employed to treat GCTs, including surgery, chemotherapy, radiation therapy, or a combination of the three. Germinomas respond very well to radiation therapy, but mixed germ cell tumors (MGCT) do not. The best treatment for MGCTs is still controversial, but some data indicate favorable responses to chemotherapy, radiation therapy, and surgery. The roles and efficacy of each therapeutic modality, especially surgical intervention, are debated.

Methods: A 14 year old female with a suprasellar mixed malignant germ cell tumor was treated with complete surgical resection, chemotherapy, and radiation therapy. A literature search was performed to explore the current treatment options and prognosis of such a diagnosis.

Results: Gross-total resection of the suprasellar mass was achieved. The tissue stained positive for synaptophysin, NF protein, mNSE, GFAP, PLAP, S100, AFP, bHCG, CD30, WS Keratin and Pan-Keratin, and EMA. The MIB-1 was diffusely increased in all tumor tissue. A diagnosis of mixed malignant germ cell tumor was confirmed. A review of the literature from 1985 to the present suggests attempted gross-total resection combined with platinum-based chemotherapy regimens as well as radiation appear to offer best survival for patients with MGCTs.

Conclusions: Surgical resection (when feasible) followed by platinum-based chemotherapy and radiation therapy is recommended based on the available literature. This combined approach has also been effective in this patient who is currently neurologically intact and without evidence of recurrence on serial imaging 20 months after the initial diagnosis.

110. Exophytic Gbm To The Cerebello-pontine Angle In The Pediatric Population: Case Report And Review Of The Literature

Rick L. Edgar, MD; Scott Elton, MD (Columbus, OH)

Introduction: We present the case of an 11 year old female with a six month history of frontal headache, followed by progressive ataxia, and L facial droop found to have a hemorrhagic left cerebello-pontine angle heterogenous mass with associated edema. A left retro-sigmoid approach was used for resection revealing a very friable mass. Pathology was found to be consistent with Gliobastoma Multiforme.

Methods: A Pubmed search of the literature was performed to determine the incidence of high grade gliomas in the cerebello-pontine angle in the pediatric population.

Results/Conclusions: The incidence of high grade gliomas in the cerebello-pontine angle in children is extremely low. We present the case of a high grade hemorrhagic lesion in this location as well as a thorough review of the literature in order to help delineate the most appropriate treatment plans for these lesions.

111. Endovascular Challenges Of Intracranial Infectious Aneurysms In The Pediatric Population

Christopher S. Eddleman, MD, PhD; Daniel Surdell, MD; Arthur DiPatri, MD; Ali Shaibani, MD (Chicago, IL)

Introduction: An attractive treatment of intracranial infectious aneurysms in the pediatric population has been endovascular treatment due to its reported effectiveness and safety profile when compared to surgery. In this report, we discuss our experience with various endovascular treatments of infectious aneurysms in the pediatric population and review the available endovascular modalities.

Methods: Three cases of ruptured intracranial infectious aneurysms were diagnosed and treated using three different endovascular approaches. The techniques utilized were coil embolization of a proximal saccular aneurysm, parent artery occlusion with coils and parent artery occlusion with liquid embolic polymers. In the first case, the parent artery was preserved while maintaining good distal flow. In the other cases the parent artery was catheterized then the parent artery/aneurysm was occluded with either coils or a liquid embolic polymer. There were no complications.

Results: Each of these cases resulted in complete occlusion/isolation of the infectious aneurysm from the cerebral circulation without additional neurological deficits. Radiographic confirmation of occlusion/exclusion was confirmed by angiographic contrast injection. Delayed surveillance imaging revealed durable obliteration of these aneurysms.

Conclusions: Endovascular therapy has been shown to be a safe and an effective treatment option in children with infectious intracranial aneurysms. These lesions convey a natural history with considerable morbidity and mortality thereby making effective and durable treatment paramount. Further, resolution of infectious aneurysms after antibiotic therapy is highly variable. As such, endovascular therapy should be considered at the time of diagnosis of an infectious aneurysm, especially in the pediatric population, given its favorable results and safety profile.

112. The Seldinger Technique For Ventricular Catheter Exchange

David F. Bauer, MD; R. Shane Tubbs, PhD, PA-C; Leslie Acakpo-Satchivi, MD, PhD (Birmingham, AL)

Introduction: Previously, the Seldinger technique has been used for insertion of difficult to place vascular catheters. The authors describe the use of this technique in exchanging difficult to place ventricular catheters in a child with multiloculated hydrocephalus and ventriculoperitoneal shunt infection.

Methods: A thin, flexible, hydrophilic catheter (Radifocus Glidewire, Terumo Medical, NJ) was truncated to 35 cm and the angled tip was transected. This modified wire was then used to cannulate two existing ventricular catheters. Each catheter was exchanged for a ventriculostomy over the glidewire. No complications were observed.

Results: Catheter placement was identical to preoperative location on postoperative imaging.

Conclusions: The authors believe that the modified Seldinger technique may be of use in selected cases of ventricular catheter exchange. With the increase use of endoscopy to place intracranial catheters, holes in intracranial catheters are more common and thus the Seldinger technique may increase in its usage.

113. Circumferential Vertebrectomy With Reconstruction For Holocervical Aneurysmal Bone Cyst At C4 In A 15-year-old Girl

Daniel Refai, MD; Jeffrey R. Leonard, MD; Todd J. Stewart, MD; Terrence Holekamp, BA (St. Louis, MO)

Introduction: No previous report of a holovertebral aneurysmal bone cyst of the pediatric cervical spine exists. The potential for neurologic or vascular compromise from this lesion is substantial if left untreated and the risk of recurrence or other morbidity is significant unless completely resected. The authors describe the unique case of a 15-year-old girl with a holovertebral aneurysmal bone cyst at C4, causing anterolisthesis and kyphosis, who underwent circumferential vertebrectomy with reconstruction and rigid fusion. This case highlights emerging principles for the treatment of this lesion in the pediatric cervical spine.

Methods: A 15-year-old white female presented with a 4 month history of neck pain after a mild injury, but was neurologically intact. Diagnostic imaging revealed a holovertebral, multicystic, osteolytic lesion with multiple fluid-fluid levels in the fourth cervical vertebra. Total vertebrectomy and repair was performed with fibular strut grafts and placement of rigid anterior and posterior instrumentation. This was accomplished in a single anteroposterior operative pass.

Results: Surgical treatment produced a stable bony fusion with no neurologic or vascular sequelae. This approach minimizes the risk of recurrence, as well as the possibility of postoperative spinal instability.

Conclusions: Spinal aneurysmal bone cyst in children presents diverse challenges. These lesions should be treated with complete resection to minimize the chance of recurrence. In pediatric cases, defects created by resection should be corrected by fusion to minimize the risk of postoperative instability and growth abnormality. One year follow up demonstrated a stable construct and the patient remains neurologically intact.

114. Atypical Imaging Characteristics Of An Anterior Fontanelle Dermoid Cyst

Mohammad Almubaslat, MD (New Orleans, LA); Allen Joseph, MD (Baton Rouge, LA)

Introduction: Dermoid cysts of the anterior fontanelle are relatively uncommon tumors, but ones that usually display characteristic appearance on MRI. The differentiation of these tumors from lesions that communicate intracranially becomes important in pre-operative planning. In this case, we report an anterior fontanelle dermoid cyst which displayed atypical imaging characteristics, raising concern for a cephalocele, early leptomeningeal cyst, or an old subgaleal hematoma. No similar cases were reported previously in the English literature.

Methods: A 3-month-old female was noted to have an asymptomatic soft, mobile mass in the mid forehead at 4 weeks of age. The neurological exam was normal. Subsequent increase in size over 2 months prompted an MRI. This revealed a well encapsulated, non-enhancing, cystic scalp mass extending through the AF. There was no parenchymal herniation, but the mass did display a CSF signal on all pulse sequences.

Results: Intra-operatively, the mass had clearly defined margins and was easily excised from the anterior fontanelle, with no violation of the dura. The aspirated fluid was found to be clear, acellular, with glucose and protein levels below 10 mg/dL. Pathological examination of the cyst wall revealed a hyperkeratotic squamous epithelium, with underlying adnexal structures, consistent with a dermoid cyst.

Conclusions: Dermoid cysts typically give a lipid-like signal on MRI, with a T1 hyperintense, and true T2 hypointense signal.Some have a restriction signal on DWI. This case illustrates the ability of these tumors to secrete serous fluid, likely from the underlying glandular structures, which accounts for the faster increase in size and the CSF-like appearance on MRI.

115. Atypical Rhabdoid/ Teratoid Tumors Of The Brain: A Ten Year Institutional Experience

Ashok Kumar Mahapatra, MD; Chitra Sarkar, MD; Bhawani Shankar Sharma, MD; Ashish Suri, MD; Faiz U. Ahmad, MD (India, New Delhi)

Introduction: Atypical Rhabdoid/ Teratoid tumors (AT/RT) of the brain are rare malignancies with an extremely poor prognosis. There is still no proven curative therapy available. We report our experience of twelve patients with AT/RT of brain.

Methods: Case records of AT/RT patients managed at All India Institute of Medical Sciences, New Delhi over last 10 years were retrospectively analyzed. Clinical profile, imaging findings, treatment and outcome details was studied Results: Out of twelve patients analyzed, 8 were males and 4 females. Age ranged from 8 months to 16 years, with most patients below 5 years of age. Eight patients had tumors in infratentorial compartment, while 4 had supratentorial tumors. Two patients had multifocal tumors. There were no specific imaging findings but tumors tended to be of large size. They were hyperdense enhancing masses on CT scan with hemorrhage and necrosis. All patients underwent surgery and complete tumor removal was achieved in eight patients. Eleven patients underwent chemotherapy and patients older than 3 years underwent radiotherapy (RT) also (neuroaxis and/or local boost RT). Two patients were lost to follow up. Survival time from ranged from 3 months to 2 years. Histopathology revealed typical rhabdoid cells with abundant cytoplasm and eccentric nuclei.

Conclusions: Prognosis for patients with AT/RT remains very poor despite aggressive treatment. Cooperative group clinical trials on AT/RT, that incorporate evaluations of aggressive treatment approaches and study tumor's biological behavior, are needed so that our understanding of these tumors is improved and cure rate is increased.

116. Endoscopic Excision Of Intraventricular Neurocysticercosis In Children - A Series Of 6 Cases And Review

Ashok Kumar Mahapatra, MD; Rohit Kumar Goel, MS; Faiz U. Ahmad, MD; Bhawani Shankar Sharma, MD; Ashish Suri, MD (India, New Delhi)

Introduction: Neurocysticercosis (NCC) affects both adults and children, but it is uncommon in childhood. The clinical presentation and management of intraventricular neurocysticercosis (IVNCC) in children has not been described adequately. We therefore present our series of 6 children with IVNCC managed by endoscopic excision.

Methods: A retrospective analysis of neuroendoscopic procedures performed over 6 years (2001-2006) was performed. Out of 154 proceedures, 6 were for IVNCC in children. Clinical details, imaging findings, operative details and outcome was studied.

Results: There were 3 were males and 3 females. Mean age at presentation was 12.1 years (range 4 to 18 years). Five children had cysts in the fourth ventricle while one had a cyst in the lateral ventricle. Parenchymal cysts were found in two cases while in one case there was a cyst located at the foramen of Monro as well. Obstructive hydrocephalus was present in all cases. Complete excision of the intraventricular cyst was performed in all patients. Simultaneously five endoscopic third ventriculostomies, one septostomy and one foramenotomy were performed. There were no perioperative and post-operative complications. Mean follow up duration was 24.8 months. Clinical improvement was seen in all children and none required shunting. Follow up radiology showed no residual lesion and decreased ventricle size in all patients.

Conclusions: Endoscopic IVNCC cyst excision along with internal CSF diversion is a safe and effective option and avoids shunt and its related complications in these children.

117. The Use Of Bmp-2 In Posterior Cervical Spine Fusion For Pediatric Patients: Initial Experience In Three Patients

Harlan J. Bruner, MD; John K. Houten, MD (New York City, NY)

Introduction: Recombinant BMP-2 is a replacement for autograft in anterior lumbar fusions, and early studies have reported its successful use in other spinal applications. There are no reports of its use in pediatric patients. We report our initial experience with rhBMP-2 as a substitute for autograft in pediatric patients undergoing posterior cervical fusion.

Methods: Three patients ages 3, 16, and 17, underwent posterior arthrodesis of C1-2 (2 patients) or occiput-C4 (1 patient). Indications were chronic type 2 dens fracture, os odontoideum, and occipitocervical ligamentous instability from Morquio's syndrome. In each case, allograft wrapped with rhBMP-2 collagen sponges (INFUSE, Medtronic Sofamor Danek) were packed over decorticated lamina and supplemented with rigid internal fixation. Patients were clinically assessed and imaged at a minimum of 6 months after surgery. Criteria for fusion used were: 1) absence of movement on flexion /extension x-rays, 2) presence of bone bridging between segments, and 3) lack of lucency around spinal instrumentation.

Results: There were no perioperative complications. All patients had improvement in neurological function and/or relief of neck pain. Late flexion/extension x-rays demonstrated fusion in all patients. One patient underwent a CT scan at one-year after surgery that demonstrated excellent bony bridging without evidence of ectopic bone formation.

Conclusions: In this small series, rhBMP-2 was successfully employed as a substitute for autograft in the pediatric patients undergoing upper cervical posterior fusion. If confirmed in larger studies with long-term follow-up, rhBMP-2 may represent a viable substitute for harvest of iliac crest autograft in pediatric spinal applications.

ELECTRONIC POSTERS

118. Myelomeningocele: Vertebral Level, Shunting, Surgeries, And Hospitalizations

Abdul A. Baker, MD (Dayton, OH)

Introduction: This long-term study was performed to determine the vertebral level, shunting, associated surgeries, and hospitalization distribution of a group of children born with myelomeningocele.

Methods: The hospital records were reviewed retrospectively for 61 of these patients who met the criteria of truly having myelomeningocele. These patients were followed up regularly during this period both at the hospital and at the private orthopedic clinic where possible and others were contacted by telephone interview.

Results: Of the 61 patients there were 56 survivors to adulthood (age 18), Neurologic levels were documented as thoracic (9=15%), High lumbar (9=15%), low lumbar (29=48%) and sacral (14=22%). Four out of nine with thoracic defects died by adulthood. Thirty five (57%) of the patients received VP shunts for their hydrocephalus. Patients had an average of 8.8 admissions, 7.2 total surgeries and 2.8 total types of orthopedic surgeries per patient (defined spine, hip, knee, and ankle involvement). Thoracic level patients had the most spinal surgeries (1.5 per patient) while high lumbar levels had the most hip (1.1), leg/knee (1.077) and foot and ankle surgeries (2.0) per patient. Fifty patients (79%) graduated from high school with six of them (13%) graduating from college. Twenty-three patients (38%) have been sexually active.

Conclusions: Most patients with myelomeningocele survived into adulthood, graduated from high school and were employed at some time. The most common surgeries for the study population were foot and ankle surgeries. Many adults with myelomeningocele lead very full and productive lives into their twenties.

119. Withdrawn

120. Transcutaneous Inductive Pressure Monitor: Followup Development Of A Permanently Implantable Intracranial Pressure Device

Joshua E. Medow, MD (Madison, WI)

Introduction: Symptoms of shunt malfunction are frequently inconsistent and pose diagnostic dilemmas that have the potential for adverse consequences. Observation and exploratory surgery in patients that are found later to have had a functioning shunt are often expensive and may inflict unnecessary morbidity. A means of ascertaining intracranial pressure is necessary to best treat patients with shunted hydrocephalus. The technology exists to build a functioning implantable intracranial pressure monitor to scale. We describe our operational prototype and the next step in the down sizing process.

Methods: A Medtronic Becker Burretrol system was raised and lowered changing a column of fluid between -5cmH2O and 30cmH2O. The transmitter frequencies and receiver voltages on two digital multimeters were recorded. We then pushed and aspirated on a 10ml syringe to qualitatively evaluate a waveform on a 50MHz analog oscilloscope.

Results: Voltage and frequency output varied nearly linearly with changes in pressure. Every increase in pressure by 5cmH20 resulted in an approximate increase in oscillation by 10Hz. A similar .1V per 5cmH2O increase was observed on the volt meters as well. A pressure waveform is qualitatively and quantitatively delineated with syringe manipulation.

Conclusions: An inductively powered intracranial pressure monitor has been built and demonstrates proof of concept. Additional research is necessary to further develop the device for implantation.

121. Acute Paraparesis From Intradural Ventral Spinal Arachnoid Cysts In Children: Three Cases With Follow-up

Jennifer A. Sweet, MD; John S. Myseros, MD, FACS; Amanda L. Yaun, MD; Robert F. Keating, MD (Washington, DC)

Introduction: Intradural spinal arachnoid cysts (ISAC) are an uncommon pathological entity, particularly in children. Though pediatric extradural and intradural spinal cysts have been reported, we present three cases of ventral thoracic ISACs in children with acute symptoms requiring urgent surgical decompression.

Methods: Three children, ages 3 to 6 years, presented to the emergency department with one to three days of acute paraparesis. Two children had evidence of urinary retention. None had a history of trauma or prior neurological disorder. Spinal MRs revealed anterior thoracic ISACs with significant spinal cord compression, prompting immediate surgical intervention.

Results: All patients underwent a thoracic laminectomy or laminoplasty with cyst fenestration. Postoperatively, MRs demonstrated substantial cord decompression. All patients rapidly regained motor strength and urinary function. Subsequent imaging revealed myelomalacia and, in one patient, a mildly increased ventral CSF collection that remains stable. Despite these radiographic findings, clinically all patients improved significantly.

Conclusions: Several cases have been reported of ISACs and progressive weakness or bladder dysfunction. Cases of acute symptoms following trauma have also been described. However, to our knowledge, this is the first series of pediatric patients with nontraumatic acute paraparesis secondary to ventral thoracic ISACs. In contrast to intracranial arachnoid cysts, thought to be slow growing or stable in size and rarely acute in presentation, we describe three patients with ISACs displaying acute neurological decline requiring immediate surgical decompression. Rapid diagnosis and prompt surgical intervention allows for an impressive neurological recovery. Long term follow up should include serial clinical and radiological surveillance.

122. Detection Of Important Venous Collaterals By Computed Tomography Venogram In Multisutural Synostosis: Case Report

Andrew Jea, MD (Houston, TX); Merdas Al-Otibi, MD; Abhaya V. Kulkarni, MD, PhD (Canada, Toronto)

Introduction: We describe the novel use of CT venography in the preoperative evaluation of a child with Crouzon syndrome who was being considered for Chiari decompression.

Methods: This 18 month old girl presented with treated hydrocephalus (with a ventriculoperitoneal shunt), and persistent symptomatic Chiari malformation and associated syrinx. A CT venogram was obtained because of the well-described relationship between multisutural craniosynostosis and abnormal intracranial-to-extracranial venous drainage.

Results: CT venography in our patient showed widely dilated vertebral and paravertebral veins located in the paraspinous muscles of the craniocervical junction. Because of the risk of massive intraoperative blood loss and/or occlusion of important collateral draining veins leading to intracranial venous hypertension and intractably raised ICP, the planned posterior fossa decompression was not performed.

Conclusions: CT venography is an easily obtained study that we recommend in the evaluation of children with multisutural craniosynostosis prior to cranial surgical interventions.

123. Post Traumatic Basal Ganglia Hematoma In Pediatric Age Group: A Study Of 21 Patients

Vikas Naik, MBBS, BSc; Bhawani S. Sharma, MD; Faiz U. Ahmad, MD; Ashok Kumar Mahapatra, MD (India, New Delhi)

Introduction: Traumatic basal ganglia hematomas (TBGH) are uncommon with an overall incidence of 2-3% in closed head injury. Data on outcome after such injuries in children is scarce in literature.

Methods: The patients included in this study were treated by the department of Neurosurgery, All India Institute of Medical Sciences, New Delhi over a seven year period from January 99 through December 2005. Inclusion criterion: all patients below the age of 18 yrs with definite history of trauma and hematoma in the region of caudate nucleus, lentiform nucleus, thalamus, and internal capsule with or without other intracranial injuries, were included in study. Exclusion criterion: Brain dead patients and hemodynamic unstable patients were excluded. The demographic profile of the patients, mode of injury, Glasgow coma scale (GCS) score on admission, radiological findings on CT scan, mode of intervention (whether conservative or surgical) were analyzed.

Results: Of the 90 patients with TBGH, 21 were in the pediatric age group, with age range from 4 month to 15 years (mean 7.2 years). More than 3/4th of patients were in severe head injury category. Eleven patients had no other intracranial injury apart from the TBGH, others had SDH or DAI features. Overall mortality was 52%. No difference in outcome was noted with respect to mode of injury, surgical management or presence or absence of other intracrainal injures.

Conclusions: Pediatric patients were more vulnerable to the insults caused by the severe head injury with TBGH than adults. The The overall prognosis in TBGH in pediatric population remains unfavorable.

124. Multi-slice Spiral Ct For Pediatric Intracranial Vascular Pathologies

Silvia Gatscher, MD (United Kingdom, London)

Introduction: The installation of a multi-slice spiral CT sparked our interest in using CTA and CTV in cases where we would formerly have performed MRA, MRV or catheter angiography as the intial investigation. Potential advantages of multi-slice spiral CT include rapid acquisition, ready availablitiy, ease of monitoring, high spatial resolution, some temporal resolution and relative freedom from artefacts. We believe that these attributes make mult-slice spiral CT the inital investigation of choice in the assessment of pediatric intracranial vascular pathologies.

Methods: All scans were performed on a Siemens Sensation 16 slice scanner and post processing was carried out on a Leonardo Work Station. The average estimated dosage for CT / CTA was 0.742mSv (+/- standard deviation). Contrast dose of 1ml/kg was administered as rapidly as possible and bolus timing was determined case by case.

Results: The cases presented, including varying vascular pathologies such as Vein of Galen malformation, persistent falcine sinus, dural sinus AV malformation, aneurysms and AVMs illustrate a selection of our recent experience with this technique in pediatric intracranial vascular pathologies. Multi-slice spiral CT consistently provided usefal vascular imaging. There have been no complications and it has reduced our reliance on MRA / MRV and catheter angiography. It has also provided an alternative imaging modality in those patients considered to be too unstable for more time-consuming investigations.

Conclusions: Multi-slice spiral CT offers advantages over MRI in the assessment of intracranial vascular pathologies and in our practice frequently allowed for catheter angiography to be avoided or deferred to a later stage.

125. Satyrs, Fauns, And Human Tails

Demetrios C. Nikas, MD; Yoon S. Hahn, MD; James L. Stone, MD (Chicago, IL)

Introduction: Satyrs, Fauns, Human Tails, and Pseudotails
The human tail has been intermittently described in the literature with intrigue and medical curiosity since the 1800s.

Methods: We retrieved new information and fascinating cases from the Oscar Sugar Archives kept at the UIC Department of Neurosurgery. These include:

- Tailed beings in Greek and other early civilizations
- The tailed head hunters of Nigeria
- Professor Virchow's presentation at the Berlin Medical Society
- Dr. Ornstein's observations on young Greek recruits
- Numerous French and German scientific reports from the 18th century

Results: Many lumbosacral abnormalities were described in adult male conscripts for the Greek Army in the later part of the 19th century by German doctors hired by the Greek government. The suggestion is that the ancient and early historical inhabitants of the Mediterranean world were very acute and imaginative observers and attributed to their Gods characteristics of real people. The embryologic basis for this anomaly is discussed as well as the fact that a number of different entities are described as tails because of their location. The anatomic characteristics and histopathology of numerous lesions is presented correlated with embryology.

Conclusions: Difficulties in interpretation of such themes in view of religious and other opinions about evolution and creation accompanied the early reports and still exist. Significant data is given on how the scientific community from the past century to our days responded to this medical curiosity with implications that span medicine, anthropology, art and mythology.

126. Withdrawn

127. Ventriculoperitoneal Shunt Infections In Children And Adolescents With Hydrocephalus

Márcia Maria Macedo Lima, MD; Ângela Maria Silva, MD, PhD; Carlos Umberto Pereira, MD, PhD; Egmond A. Santos, MD (Brazil, Aracaju)

Introduction: To determine frequency, etiology, site and clinical and laboratory findings of ventriculoperitoneal shunt (VPS) infections in children and adolescents with hydrocephalus managed in Hospital Governador João Alves Filho, Aracaju SE, Brazil.

Methods: A non-controlled prospective observational study comprising 50 patients that underwent VPS (58 procedures) from January/2003 to October/2004.

Results: Infections rate per procedure was 27.6%; surgical risk index (NNISS-CDC) 0 and 1-2 were 25.7% and 30.4% respectively; surgical site infections was the main complication with 50% of the cases.

Conclusions: Infection rates per procedure, per patient, and per surgical risk index were high. No statistical differences were found related to the following: age, etiology of hydrocephalus, type of procedure, pre-operative length of stay, duration of procedure, antibiotic prophylaxis, previous central nervous system catheter, and surgical risk index.

128. Retrograde Migration Of Ventriculoperitoneal Shunt To The Neck. Case Report

Carlos U. Pereira, MD, PhD (Brazil, Aracaju); Egmond A. Santos, MD (Brazil, São Paulo)

Introduction: The complications of the ventriculoperitoneal shunt are innumerable. The authors present a rare complication of this surgical procedure, that was the retrograde migration of ventriculoperitoneal shunt to the neck.

Methods: Male, 18 months, with congenital hydrocephalus, was submitted to shunt at newborn. He admitted in the emergency of João Alves Hospital (Aracaju-SE), with a tumor-like lesion in the neck. X-ray of cervical region demonstrated the ventriculoperitoneal shunt in this region.

Results: The child was submitted to surgical excision of the system. It did not have necessity of the accomplishment of implantation of new system of shunt.

Conclusions: The diagnosis of this complication is easily accomplished by palpation of the integrity of the drainage system and may be confirmed by shunt radiographs.

129. Large Occipital Aneursymal Bone Cyst Inciting Obstructive Hydrocephalus

Brian F. Seaman, DO; Richard Edgar, MD; Scott Elton, MD (Columbus, OH)

Introduction: Aneursymal bone cysts (ABC) are uncommon non-neoplastic lesions seen in children, typically affecting long bones and the spinal column (1). They make up 1% of bone tumors, with only 3%-6% seen affecting the calvarium (2). Localization to the cranial base and posterior fossa is rare. Primary ABC's, result from traumatic or anomalous venous disruption in the osseous diploë (3). Osseous hemodynamic changes and increased venous pressure and hemorrhage causes the lesion to expand (4). Presenting symptoms are typically pain or deformity. Neurological deficit or symptoms of raised intracranial pressure are rare.

Methods: In our study, we report on a case of a post-traumatic ABC arising from the diploe of the occiput with predominantly inward expansion into the posterior fossa with associated obstructive hydrocephalus. The presenting symptom in our patient was severe headache, associated with a painless superficial occipital mass. There was a recent history of mild head trauma with an initially painful occipital swelling.

Results: The lesion was initially treated with percutaneous sclerotherapy, later resected en bloc via a suboccipital approach without any complications or recurrence. Prior to definitive treatment, the patient's cephalgia was relieved via external ventricular drainage.

Conclusions: ABCs are rare benign vascular lesions, which at times can affect the cranial base and occiput. They have the potential for rapid progression and symptoms of raised intracranial pressure can be seen. Accepted treatment options for ABCs include excision, curettage (with or without bone grafting), and injection sclerotherapy (7).

130. Dynamic Stability Of All-terrain Vehicles

Julian Lin, MD; Derol Saintilus, MD; Martin Morris, PhD (Peoria, IL)

Introduction: Every year there is an increasing number of accidents involving children and all-terrain vehicles (ATVs). Defining the factors of safety involved in ATV riding as well as measuring these factors represent our goals.

Methods: We (1) designed and built a camera bracket system to capture the position and movement of riders/ATVs' center of gravity (COG); (2) created software programs to evaluate and interpret collected data; (3) conducted field tests to measure COG; and (4) measured and compared lateral, longitudinal, and vertical rider movement on different ATVs and rated their safety.

Results: The brake test, measured rider's longitudinal movement in a sudden stop, showed that largest unsafe weight to produce a predetermined unsafe 10 inch position change to be about 62 lb. The bump test, measured rider's vertical bounce when driving a bump of roughly 3.5 inches tall, showed that rider's vertical displacement is dependent on ATV's suspension and rider's weight and height. A utility ATV provided less vertical displacement than a sport ATV for a given rider's size especially if the rider's is less than 75 lb. J-hook test, used by National Highway Traffic and Safety Administration for

rollover ratings, showed that rollover safety depended on rider's wingspan and handlebar's turn angle. Total safety measure was calculated to give safety rating for different riders and ATVs.
Conclusions: Our testing results showed the dynamic stability of ATVs relative to young riders and should be useful in determining safety rating for different riders and ATVs.

131. Virtual Reality Preoperative Planning And IMRI In The Treatment Of Pediatric Brain Tumors
Peter Carmel, MD; Charles Prestigiacomo, MD (Newark, NJ); Michael Schulder, MD (Manhassett, NY); Jeffrey E. Catrambone, MD (Newark, NJ)
Introduction: Microneurosurgical resection of pediatric brain tumors represents the gold standard in the treatment of pediatric brain tumors. However, recent technological advances include the introduction of iMRI and virtual reality workstations allow for an unparalleled planning and execution of neurosurgical procedures. In our study we introduce the concept of using both virtual reality surgical planning using the Dextroscope© and surgical execution using the ODIN© N-20.
Methods: Five cases of pediatric brain tumors treated using iMRI in and preoperative planning using the virtual reality planning workstation, the Dextroscope© were retrospectively reviewed. Preoperative planning result, surgical result, tumor type, patient age, additional time of iMRI and patient outcome were all assessed.
Results: In one case preoperative planning using the Dextroscope© including fusing the MRI with CT-Angiography led to eliminating surgical resection as a possibility. In the four other cases virtual reality assisted in understanding the three dimensional structure of the tumor enabling greater execution of the planned surgery. In three of the four iMRI cases iMRI led to changes in surgical decisions including further surgical resection.
Conclusions: Further technological advances in neurosurgical technique aid the pediatric neurosurgeon in planning and execution of surgical resection of brain tumors. Preoperative planning with virtual reality and iMRI aid in the care of pediatric brain tumors.

132. Pediatric Shunt Tunnel Catheter Infection: Case Report
Sheri Dewan, MD, MS; Stephanie Greene, MD (Providence, RI)
Introduction: Tunnel infection is well-reported in patients with central lines and peritoneal dialysis catheters. We report the first case of shunt tunnel infection, without ventriculitis, in the neurosurgical literature.
Methods: A 2-year-old female with a history of hydrocephalus secondary to a Dandy-Walker malformation, shunted shortly after birth, presented with a 2-day history of lethargy, fever, and a striking linear erythema overlying the shunt tract in the chest. She had no previous shunt revisions. Cerebrospinal fluid (CSF) analysis was negative for infection. The serum white blood cell count was elevated. Computed tomography of the abdomen showed no evidence of pseudocyst or intra-abdominal abscess. An echocardiogram was negative for vegetations. Her shunt was externalized at the clavicle, and a large amount of purulent drainage was expressed from the distal catheter tract.
Results: The shunt catheter tip culture was significant for group A beta-hemolytic streptococcus. CSF cultures were negative throughout the hospital course. The patient was placed on vancomycin after consultation with an infectious disease specialist. The patient underwent removal of the externalized shunt and placement of a new shunt on the opposite side after ten days of negative CSF cultures. She was discharged after forty-eight hours of additional antibiotics at her neurologic baseline.
Conclusions: To our knowledge, this is the first published case of shunt tunnel infection reported in the literature. The mechanism is postulated to be transient bacteremia. Pediatric neurosurgeons should be aware of this possibility when evaluating patients for shunt infection.

133. Mycoplasma Meningitis Resulting In Increased Production Of Cerebrospinal Fluid: Case Report And Review Of The Literature.
Leslie Acakpo-Satchivi, MD, PhD; David F. Bauer, MD; R. Shane Tubbs, PhD, PA-C (Birmingham, AL)
Introduction: We report a case of increased cerebrospinal fluid (CSF) production in a child with concomitant mycoplasma meningitis. This four-year-old boy presented with a two-week history of body aches, malaise, and headaches. He developed sudden onset of obtundation, apnea, left eye deviation, and bilateral dilated and unreactive pupils. A ventriculostomy was placed initially for a poor neurologic examination in the setting of likely meningitis. Initial intracranial pressure was high, and CSF production was supraphysiologic for the first few days of empiric, broad spectrum treatment. Mycoplasma meningitis was diagnosed. The ventriculostomy was weaned after adequate treatment for mycoplasma meningitis.
Methods: We performed a review of the literature using the Medline database.
Results: We found no mention in the literature of supraphysiologic CSF production possibly caused by mycoplasma pneumonia meningitis. We found animal data describing hydrocephalus produced by intracerebral injection of mycoplasma pneumonia. One case report described the need for CSF diversion in a neonate with mycoplasma hominous meningo-encephalitis.
Conclusions: Untreated mycoplasma meningitis may cause raised intracranial pressure (possibly as a result of increased CSF production) and result in a poor neurological examination. In this setting, CSF diversion in the form of an external ventricular drain may be beneficial to preserve neurologic function during treatment with antibiotics.

134. Management Of Tissue Loss Associated With Ventriculoperitoneal Shunt In Irradiated Scalp: Use Of Integra Bilayer Tissue Substitute
Ethan A. Benardete, MD, PhD (Brooklyn, NY)
Introduction: The cranial site of a ventriculoperitoneal shunt can become an area of skin loss particularly in patients receiving external beam radiation. The radiation dermatitis can make wound revision exceedingly difficult. Use of free tissue transfer techniques can incur significant mobidity. We report a case of tissue loss in a previously radiated patient with a ventriculoperitoneal shunt successfully treated with Integra bilayer matrix tissue substitute. This protocol (Gonyon & Zenn, 2003), although previously described with hyperbaric oxygen, was used without it in this case. The technique is simple and avoids the need for complex grafts to heal difficult scalp wounds.
Methods: The ventriculoperitoneal shunt was removed and a new lumboperitoneal shunt was placed. The wound was debrided of all necrotic tissue. In some areas, no viable pericranium remained and the outer cortex of the skull was removed with a high-speed burr. The Integra bilayer matrix tissue substitute was then applied after being cut to conform to the defect. The substitute material was stapled into place. The patient was discharged to home with instructions on how to apply a standard sterile dressing.
Results: After three weeks, the outer silicone layer was removed and a split-thickness skin graft was applied. Viable skin coverage was obtained.
Conclusions: Survivors of cranial radiation can pose challenges in the management ventriculoperitoneal shunts. In this patient, wound breakdown was managed with a novel skin substitute followed by split-thickness skin grafting. This method limits donor-site morbidity and the need for specialized grafting techniques.

135. Transcranial Meningioma With Cerebral Sinus And Internal Jugular Vein Occlusion: Case Report And Literature Review
Shobhan H. Vachhrajani, MD; Andrew Jea, MD; James T. Rutka, MD, PhD (Canada, Toronto)
Introduction: Meningiomas represent the most common benign intracranial neoplasm in adults, with considerably lower incidence in children. We present the first reported case of a transcranial meningioma with invasion of, and intraluminal extension into, the transverse and sigmoid sinuses, the jugular bulb, and the internal jugular vein resulting in occlusion.
Methods: The medical chart of the 16-year-old female patient was reviewed, and the literature searched. Pre-operative CT and MRI scanning, and conventional angiography was performed. She underwent a two-staged surgical resection: the supratentorial portion was resected in November 2006, and the infratentorial component was removed in June 2007 through a multidisciplinary skull base approach.
Results: The patient remained neurologically intact after tumour resection. She developed CSF otorrhea, sealing after several days of lumbar drainage. Postoperative imaging confirmed gross total resection. The patient was discharged from hospital with an excellent outcome.
Conclusions: We present the first case of a pediatric transcranial meningioma with growth within the transverse and sigmoid sinus, and distal occlusion of the internal jugular vein. A staged approach with interval recovery likely provides the highest chance for complete resection, preservation of neurological status, and minimization of perioperative morbidity.

136. New Jersey Criteria For The Pronouncement Of Brain Death In Children: Confusion Amongst Hospital Based Caregivers

Shawna R. Calhoun, BS; Pamela M. Deangelis, RN; Catherine A. Mazzola, MD (Morristown, NJ)

Introduction: New state brain death regulations were recently adopted in January 2007 in New Jersey. There is significant confusion regarding the pronouncement of brain death in children. This confusion often accounts for the loss of potential organ donation. With a long list of children who could benefit from organ donation, it is important to identify factors which may impede donation from patients who meet the criteria for brain death.
Methods: 59 pediatric health care providers (attendings, residents, nurses, and students) completed a 19 question survey about the criteria for the pronouncement of brain death in children.
Results: The highest score recorded was 15/19 questions answered correctly. Most respondents were only able to correctly answer 7/19 questions.
Conclusions: Most respondents were not aware of the current NJ state regulations regarding pronouncement of brain death in children. The criteria for the pronouncement of brain death, the mechanism of brain death examination, and the qualifying confirmatory tests were not known or understood by most respondents.

137. An Aggressive Multi-modality Treatment Paradigm For Pediatric Glioblastoma Multiforme: A Case Report

John R. Orphanos, MD; Kymberly Gyure, MD; John J. Collins, MD (Morgantown, WV)

Introduction: Although an uncommon pathology among pediatric patients, Glioblastoma Multiforme (GBM) in childhood may exhibit longer periods of remission than occur in adults. Some studies have suggested a possible molecular basis for improved outcomes in childhood. Most children, nevertheless, usually die within three years of initial diagnosis. This case illustrates an 11-year-old female diagnosed with right thalamic GBM and highlights the aggressive, multi-modality sequence of treatments that helped her achieve a five year long, high quality of life survival.
Methods: In 2002, after initial diagnosis, the patient underwent tumor resection and treatment with Temozolmide plus radiation therapy. Local recurrence later prompted re-operation and Gliadel implantation. Gamma Knife boosted her radiotherapy. Temozolamide maintenance followed. In 2005, cerebrospinal fluid (CSF) dissemination developed. The patient underwent spinal irradiation and entered a phase 1 trial of Irintecan plus Cetuximab. Recurrence required the phase 1-b trial of Oxiplatin with 5-Fluorouracil plus Leucovorin. Spinal disease resolved, but eventually new intracranial tumor developed within brain cisterns. Irinotecan and Avastin with Temozolamide provided suppression. In 2007, tumor again progressed. The patient received combination therapy including Tarceva, Accutane, Thalidomide, and Celebrex.
Results: Throughout these treatments the patient maintained high quality of life until the final two months. She passed away in June 2007, five years from initial diagnosis.
Conclusions: A sequence of aggressive, multi-modality treatments such as described in this case report may facilitate the acheivement of longer and better quality remission periods in pediatric GBM. It is unclear, however, whether such a strategy would apply to adult GBM.

138. Unusual Metachronous Pleomorphic Xanthoastrocytoma With Malignant Transformation

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Introduction: Pleomorphic xanthoastrocytomas are rare, accounting for < 1% of surgical astrocytomas. Since its initial description by Kepes in 1979, about 240 cases have been reported. Approximately 1/5 of these cases have been characterized as either anaplastic PXAs or PXAs with malignant transformation, signaling caution in regarding PXAs as generally benign.
Methods: To our knowledge, this is the first report of a metachronous PXA with malignant transformation and p53 positivity.
Results: A 5-year-old girl, right handed, presented to the Hospital for Sick Children in May 2006 with 3-week history of headaches. A 10 X 8 cm right temporoparietal multi-lobulated lesion was found with solid and cystic areas. Gross total resection of this lesion revealed diagnosis of PXA. Focal necrosis, mitoses 7/10 HPF, and MIB-1 index 10% were noted. One year later, serial MRI revealed left peri-Sylvian 6 X 4.5 cm heterogeneously enhancing mass. Debulking was performed. Malignant transformation was noted with microvascular proliferation, pseudopallisading necrosis, and MIB-1 index > 50%. p53 mutation was present. Spinal imaging was negative. She is currently undergoing adjuvant therapy.
Conclusions: Nosology and histogenesis of PXA remain poorly understood. Recent studies posited that PXAs may arise from bipotential precursor cells, mesenchymal cells or residual germinal matrix. p53 mutations, although rare, are possible in PXA with glial de-differentiation. The mechanism of malignant transformation is unknown. Multivariable analysis (Giannini, et al.) showed only mitotic index to be statistically significant in predicting overall survival. No correlation was found between the extent of resection and overall survival. The role of upfront adjuvant therapy remains unclear.

139. The Use Of A Lexan Board To Maximize Patient Positioning For Intraoperative Mri

Jessica Joy, RNFA, CNOR; Richard Hart, BS; Rosa Sanchez, RNFA, CNOR; David Macomber, RN, CRNFA; David Donahue, MD; John Honeycutt, MD (Fort Worth, TX)

Introduction: There are many challenges in optimally positioning a pediatric patient during intraoperative MRI procedures. Positioning must be focused not only on optimal surgical position, but optimal imaging position as well. We have designed a Lexan board to help facilitate patient positioning for intraoperative MRI cases.
Methods: Cook Childrens' Hospital houses the Imris intraoperative MRI system. The magnet is a Siemens 1.5 Tesla 70cm bore magnet. According to Imris positioning recommendation, the target site should be seven inches from the head of the operating bed. The Lexan board measures 120cm x 44cm x 1cm. A 3x8 cm modification at the head of the board has been made to allow for single channel coil maneuverability.
Results: Since February of 2007, we have completed 41 imaging cases in our intraoperative MRI suite. We have used the Lexan board in each case. The board allows the patient to be extended past the end of the OR table to allow for optimal positioning of the site of interest for the mobile magnet. The Lexan material provides a stable and safe support in an MR safe environment. For children less than 7 years of age, positioning for craniotomies would be near impossible without the Lexan board. Even for adult size patients, the board allows the patient to be quickly moved to optimize positioning for the magnet. We have also used the board in positioning for spinal intraoperative MRI scans.
Conclusions: We have found the Lexan board to be an invaluable tool in positioning patients for pediatric intraoperative MRI cases.

140. Management Of Idiopathic Small Syringes In Pediatric Patients

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Introduction: Management of patients with small syringes in the absence of Chiari malformation, tethered spinal cord, trauma, or neoplasm has not been clearly defined. We review the management of a series of pediatric patients with this condition.
Methods: Sixteen pediatric patients with idiopathic syringomyelia ranging in age from 22 months to 15 years (median=9.5yrs) presenting at a single institution between 1998 to 2007 were identified. Patients with a syrinx less than 3mm or without clinical follow-up were excluded. The most common presenting complaint was low back pain (n=7, 44%), followed by weakness with spasticity (n=2), neck pain (n=2), incontinence (n=1), leg pain (n=1), knee pain with hyperesthesias (n=1), and sacral hemangioma (n=1). At presentation 12 patients were neurologically intact (75%), 2 had spasticity and poor tandem gait, 1 had hyperreflexia, and 1 had hyperesthesias. Syringes involved at least 2 spinal levels and included both cervical and thoracic levels in 69% of cases (n=11). Maximum syrinx diameter ranged from 3 to 12mm (median=5mm). Clinical follow-up ranged from 2 months to 6 years (median=2yrs).
Results: Cervicomedullary decompression was performed in 2 patients. One patient presented with spasticity and difficulty walking that improved postoperatively. The other had surgery for cervicothoracic cord expansion with ventriculomegaly and has remained neurologically intact. The remaining 14 patients have been managed without operations.
Conclusions: The majority of patients with small idiopathic syrinx cavities without an identifiable etiology can be followed with sequential neurological examinations and MRI scans. Surgical intervention is indicated for a minority of patients with neurological deficits and significant cord expansion.

141. Instrumented Screw Fixation Of C1 And C2 In Pediatric Patients: A Retrospective Review Of 10 Cases

Francesco T. Mangano, DO; Lynn M. Serrano, DO; Alvin Crawford, MD; Atiq Durrani, MD; Kerry Crone, MD (Cincinnati, OH)

Introduction: Posterior instrumented fusions of C1 and C2 are common in the adult patient population but limited within pediatrics due to the dynamic growth of the cervical spine. The purpose of this review is to report safe and effective instrumentation of C1 and C2 at young ages, increasing treatment options for congenital and traumatic conditions in the upper cervical spine in the pediatric population.

Methods: A retrospective chart review was completed to collect data on pediatric upper cervical spine posterior instrumented fusions at Cincinnati Children's Hospital Medical Center from 2005 to 2007. Both congenital and traumatic pathologies were considered. Operative techniques incorporated a variety of subaxial levels but consistently included screw fixation of C1 and/or C2. Patient demographics, underlying etiology, pre-operative workup, diagnosis, operative procedure, follow-up care and complications were documented. Post-operative radiographs were reviewed and comparison was made to pre-operative alignment. Patient clinical status and symptoms were documented before and after treatment.

Results: A total of 16 posterior cervical fusions were indentified from 2005-2007. Ten cases which involved C1 and/or C2 were selected for analysis. Ages ranged from two to eighteen. No instances of clinical deterioration were noted post-operatively. Follow-up imaging confirmed stable constructs in all of the cases reviewed. No complications were noted.

Conclusions: Posterior cervical constructs including instrumentation at C1 and C2 can be safely and effectively performed in selected pediatric patients with good outcomes.

142. Disconnection Syndromes Following Corpus Callosotomy: An Updated Review

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Introduction: Corpus callosotomy is an accepted surgical option in epilepsy patients presenting with drop attacks. Disconnection syndromes are recognized neurological sequelae, and may manifest with a variety of sensory and motor deficits. We present an updated review of these fascinating conditions and augment our current understanding with diffusion tensor imaging tractography and plausible artistic renderings of responsible commissural pathways.

Methods: An extensive literature search was performed examining the history of corpus callosotomy, its use in the treatment of epilepsy, and its neurological complications - the disconnection syndromes. Commissural pathways composing the corpus callosum were approximated by matching each disconnection syndrome with an anatomic site of disruption, and were confirmed by correlating with diffusion tensor imaging.

Results: Since the incidental discovery of corpus callosotomy as a treatment for epilepsy in 1931, several disconnection syndromes have been studied. Acute syndromes may result from prefrontal lobe disconnection, while chronic manifestations may arise from disconnection of either temporal, parietal, or occipital lobes, as well as from disconnection of the precentral or postcentral gyri. Deficits in visuospatial perception, language reception and expression, and motor skills may be differentially produced based on anatomical location.

Conclusions: Disconnection syndromes are an interesting neurological consequence of corpus callosotomy. The anatomical origins are varied and result in multiple deficits of sensory and motor function. We present an updated review and provide new imaging and illustrations to further elucidate clinical and anatomical correlations in this condition.

143. Complications Of Ventriculo-atrial Shunts; A Report Of Two Cases And A Review Of The Literature.

Neal G. Haynes, MD; John A. Grant, MB (Kansas City, KS)

Introduction: Ventricular shunting with the atrium as terminus (VA Shunt) was formerly a common pediatric procedure which fell by the wayside with the ease and comparatively few complications of peritoneal terminus shunts. Among the more common complications of VA shunts were shunt nephritis and cor-pulmonale, as well as the need to revise a shunt for the purpose of lengthening the distal end.

Methods/Results: We report on two patients with unusual complications after long term placement of VA shunts lost to followup with their primary neurosurgeon. The first was a 26 year old man who had a VA shunt placed five years prior to presentation. He was referred to the neurosurgery service with a large thrombus on the atrial end of his VA shunt. Because of the danger of dislodging the thrombus, a thoracotomy was required to remove the distal shunt. The second patient had a VA shunt placed over 40 years prior to presentation with cardiac arrhythmias which were found to be related to a piece of shunt tubing that had broken off and lodged into the pulmonary artery. Each heartbeat forced the free end to circle around the ventricle causing myocardial irritation. This patient's arrhythmias resolved after removal of the distal catheter end.

Conclusions: There are many patients with old and possibly non-working VA shunts placed during childhood who may not be currently followed by a neurosurgeon. Physicians should have a high index of suspicion for any shunted or previously shunted patient with an atrial terminus.

144. Endoscopic Resection Of Posterior Third Ventricle Tumors

Robert J. Bollo, MD; Aqsa Durrani, BA; David H. Harter, MD; Mark M. Souweidane, MD; Jeffrey H. Wisoff, MD (New York, NY)

Introduction: The most common pediatric tumors occurring within the posterior third ventricle are glial tumors and ependymomas. One-thirds of these gliomas are low-grade. 15% of supratentorial ependymomas in children occur primarily in the third ventricle. The most significant predictor of long-term survival for children with a supratentorial ependymoma is complete resection, with reported overall survival of approximately 80%. The role of adjuvant therapy in completely resected tumors is controversial. However, surgical morbidity in this region is high, and endoscopic biopsy combined with third ventriculostomy and adjvant therapy is the most common approach to management. Total resection using neuroendoscopy may significantly decrease surgical morbidity for select posterior third ventricle tumors.

Methods: We reviewed the clinical data, surgical technique, pathology, adjuvant treatment, and neurologic outcome for 4 patients, ages 6-31 years, who underwent surgical management of a posterior third ventricle tumor.

Results: Three patients underwent endoscopic third ventriculostomy and endoscopic tumor resection. Pathology revealed two ependymomas and one atypical mixed glioma (WHO II). One of the ependymomas was anaplastic; this patient received adjuvant proton-beam radiotherapy. There was no neurologic morbidity in this group. One patient underwent endoscopic third ventriculostomy and tumor biopsy, followed by open, transcallosal resection. This patient suffers from persistent, mild short-term memory loss. All patients remain disease-free, with follow-up of 3-30 months.

Conclusions: Endoscopic gross-total resection and progression-free survival in this small series of patients with posterior third ventricle tumors using neuroendoscopy raises the possibility that select patients successfully managed by endoscopic resection and third ventriculostomy alone.

145. Treatment Of Subependymal Giant Cell Astrocytomas In Tuberous Sclerosis Complex

Fernando Campos Pinto, MD; Manoel Jacobsen Teixeira, PhD, MD; Umbertina Conti Reed, PhD, MD; Hamilton Matushita, PhD, MD; Sergio Rosemberg, MD, PhD (Brazil, São Paulo)

Introduction: The subependymal giant cell astrocytoma (SEGA) is considered one of the major feature of Tuberous Sclerosis Complex (TSC). Treatment of this intraventricular tumor is controversial because the basic nature of these lesios is not clear. Although SEGA is histologically benign, grade I in the WHO classification, it represents the major cause of morbidity and mortality related to TSC.

Methods/Results: A restropective analysis was done on the medical reports of 20 consecutive patients with histopahological diagnosis of SEGA admitted to the Pediatric Neurosurgery of Department of Neurosurgery of São Paulo University Medical School, from April 1992 to April 2007. There were 12 females and 8 males, ranging in age at the diagnosis of the tumor, from 11months to 22years 9 months (mean age=10,5y). The first manifestation of the disorder was convulsion (15/20), and signs and symptoms of intracranial hypertension (5/20). The intraventricular tumor was disclosed during evaluation of epilepsy in 11/15 patients. During observation of these 15 patients that had presented with epilepsy: four patients experienced acute signs and symptoms of intracranial hypertension , and four patients became symptomatic subacutely with increased seizure frequency, behavioral disorders, and definitive visual déficits. Sequential neuroimaging study was done in 8 cases, and growth of the tumor was detected in 5 cases. All

patients were submitted to surgical treatment. Total ressection was achieved in 20/24 tumors. There was no mortality, and three patients developed minor postoperative complications.
Conclusions: Surveillance therapy of the initial asymptomatic tumor in patients with TSC may result in higher morbidity than profilatic surgical treatment.

146. Colloid Cyst In Children: Current Management Strategies
Zulma S. Tovar-Spinoza, MD (Canada, Toronto)
Introduction: Few published series described colloid cysts in children and their natural history remains unclear. We reviewed children with colloid cysts at the Hospital of Sick Children (HSC) in Toronto and evaluated the natural history, clinico-radiological presentation and treatment in the pediatric population.
Methods: A database search at HSC identified eight cases of third ventricular colloid cyst between 1952 and 2006. Their presentation and management were analyzed and compared with the reported series in children.
Results: Mean age was 13.2 years. Male: Female ratio was 5:3. Four children presented with acute neurological deterioration; seven patients complained of headaches. One case was discovered incidentally. Two patients died due to acute increased intracranial pressure. All patients had initial CT scans; three patients underwent MRI. Mean size of the cyst was 1.7 cm. Five symptomatic cases underwent surgical resection. Two patients had emergency ventricular diversions while one had a ventriculoperitoneal shunt inserted. Two cases needed repeated surgical procedures. One patient suffered a thalamostriate vein thrombosis and one had a mild memory deficit. Mean follow up was 3.4 years for the patients having one surgery. Post-operative imaging was obtained in all but one surgical case.
Conclusions: Colloid cysts are rare and potentially lethal in children. The natural history depends on lesion size, and ventricular obstruction. Children often have acute presentation symptom; symptomatic patients need prompt surgical treatment, whereas asymptomatic patients without hydrocephalus can be followed expectantly. Further study is necessary to determine the best treatment for the asymptomatic patient, and to understand the mechanism of recurrence of these lesions.

147. Primary Spinal Cord Astrocytomas In The Pediatric Population
Gordon McComb, MD; Mark Krieger, MD; Ruth E. Bristol, MD (Los Angeles, CA)
Introduction: Intramedullary spinal cord astrocytomas are uncommon tumors in childhood. There is little current data on specific therapy and outcome of astrocytomas in this location in children.
Methods: The hospital and clinic charts of 16 patients, aged 2 to 13 at presentation, were retrospectively reviewed. Imaging, pathology, and operative reports were also reviewed.
Results: Scoliosis was the first sign of disease in half of the patients. In half of this group, medical attention was sought only after further symptoms developed. Other symptoms included unilateral weakness, gait disturbance and pain. Mean age at presentation was 8 years, (range 2-13). Half of the patients had subtotal resections on initial surgery with subsequent gross total resection, the other half had gross total resection initially. Recurrent disease occurred in 4 patients. Four patients underwent chemotherapy and two had radiation. One patient's pathological diagnosis changed to ependymoma after further review 3 years later (omitted from study).
Conclusions: A small percentage of patients with scoliosis will harbor spinal tumors. This supports the need for MRI imaging in scoliosis patients. In addition to surgical resection, chemotherapy and radiation therapy can be employed to improve progression free survival in patients with higher grade lesions. Low grade astrocytomas of the spine can be cured with complete resection. Even small residuals can remain unchanged for many years.

148. Lessons And Pitfalls In The Establishment Of A Pediatric Interventional Neurovascular Program-a 5 Year Experience
W. Jerry Oakes; Joseph Horton; Leslie Satchivi; John Wellons; R. Shane Tubbs; Chevis Shannon; Jeffrey P. Pugh, MD; Jeffrey P. Blount (Birmingham, AL)
Introduction: Endovascular techniques are highly useful in diagnosing and treating a variety of different neurologic conditions that affect children. Five years ago we established a pediatric interventional neurovascular program within a purely pediatric intraoperative environment and report here our initial experiences.
Methods: Case records and the neuroangiography database were reviewed. Observations, outcomes (immediate procedural outcome and 6 month follow up) and problems were compiled for presentation. All procedures were performed in the operating room of the Children's Hospital. A C-arm based platform with rapid post process imaging capability was utilized for all studies. All studies were performed by a single senior neuroradiologist.
Results: One hundred and seventy procedures were performed in 148 children. Numbers of procedures ranged from 1-11 and age ranged from 1 month to 25 years. One hundred and twelve procedures were diagnostic angiograms of which 73 resulted in normal studies. Abnormal diagnostic angiograms revealed 16 AVMs, 7 aneurysms, 3 dissections and three Galenic malformations. Nine WADA tests were performed (ages 8-20). Transfemoral intraarterial embolic occlusion was attempted 16 times and was successful 14 times. There were no strokes or returns to the operating room. There were 3 puncture site hematomas and one catheter was glued into the proximal portion of an AVM. One child with a normal angiogram thought to have a cavernoma later bled catastrophically.
Conclusions: With experience an effective neuroangiography program can be established in a pediatric environment utilizing widely available readily affordable equipment.

149. Post-surgical Dti Findings In Pediatric Supratentorial Brain Tumor Patients
Weihong Yuan, PhD; Francesco T. Mangano, DO; Kerry Crone, MD (Cincinnati, OH); Scott K. Holland, PhD (Cincinnati, PA); Dean Hertzler, MD; Blaise V. Jones, MD (Cincinnati, OH)
Introduction: DTI findings in post-surgical follow-up for pediatric supratentorial tumor patients. In our previous report, diffusion tensor imaging (DTI) was applied to study supratentorial pediatric brain tumors and the adjacent and contralateral normal appearing white matter (NAWM). The present study is a follow-up of the same patient group based on post-surgical DTI evaluation.
Methods: Eight patients (M/F=5/3; age = 10.4+/-5.5 yrs; low/high grade =6/2) were included. Pre- and postoperative DTI parameters were compared among various WM regions (t-test). DTI tractography was performed to reconstruct cortical-spinal tracts (CST) and FA values along CST were calculated bilaterally. Correlation analysis was performed to evaluate WM changes in ipsilateral CST relative to that in contralateral CST.
Results: The adjacent NAWM and contralateral NAWM demonstrate no significant difference in all post-operative DTI parameters (at p=0.05). There is no statistically significant difference between the pre- and post-surgical measurement (at p=0.05). In three subjects with peritumoral edema, all showed increased FA (>42%) and decreased MD(>33%) post-operatively. Preoperatively only 1/8 patients demonstrated a statistically significant correlation coefficient (at p<0.05) when comparing ipsilateral and contralateral CST FA values. After the surgery, 7/8 patients demonstrated such a trend (chi-squared = 9, p=0.0027).
Conclusions: The post-operative DTI values, the changes in regional peritumoral edema, and the pre- and post-surgical difference of the number of subjects with highly correlated FA values along ipsi- vs. contralateral CST, may be a reflection of the underlying WM recovery/integrity after tumor resection.

150. Radiolucent Hair Accessories Cause Depressed Skull Fracture Following Blunt Cranial Trauma: Report Of Two Cases
Todd C. Hankinson, MD; Omar N. Syed, MD; Richard C.E. Anderson, MD; Neil A. Feldstein, MD (New York, NY)
Introduction: Pediatric neurosurgeons frequently care for patients with traumatic scalp and skull injury. Foreign objects are often appreciated on CT scan and/or radiographs and may influence the clinician's decision-making process. We report two cases of poorly visualized hair beads that were impacted into the skull during blunt trauma, resulting in depressed, comminuted skull fracture.
Methods: Two children presented to the Children's Hospital of New York - Columbia University following blunt cranial trauma. CT scans demonstrated depressed, comminuted skull fractures with poorly visualized spherical radiolucencies in the scalp overlying the fracture site. The nature of these objects was initially unclear and they could have represented air that entrained into the scalp during trauma. Both patients were taken to the operating room for elevation of the skull fracture and wound exploration.
Results: In both cases, spherical plastic hair beads had compacted through the scalp and into the skull, resulting in depressed skull fracture. In one case,

scalp inspection did not demonstrate evidence of the bead. In the other case, a second bead could be appreciated at the site of scalp laceration. In both cases, the beads were removed operatively and the patients recovered uneventfully.
Conclusions: Radiolucent fashion accessories, such as hair beads, may be difficult to appreciate on clinical exam and may masquerade as clinically insignificant air following cranial trauma. The operative removal of these foreign bodies may prevent infection and should be undertaken in these cases. Pediatric neurosurgeons should consider hair accessories in the differential of foreign bodies that may produce skull fracture following blunt trauma.

151. Endovascular Management Of Pediatric Intracranial Arteriovenous Malformations With Onyx
L D. Lunsford, MD; Tudor G. Jovin, MD; Ajith J. Thomas, MD; Brian T. Jankowitz, MD; Michael B. Horowitz, MD; Doug Kondziolka, MD (Pittsburgh, PA)
Introduction: Onyx is a relatively new liquid embolic agent. The initial success with this polymer will result in increased utilization in children, although its use and safety in the pediatric population has not been firmly established.
Methods: Between December 2005 and May 2007, the brain AVMs of five children were embolized with Onyx. The ages ranged from 8 days to 1, 11, and 12 years of age. Pathology included 3 classical AVMs, 1 Vein of Galen malformation, and 1 atypical AVM which replaced >50% of the intracranial volume. Clinical presentation included intracranial hemorrhage (2), papilledema (1), and high output heart failure (2).
Results: In five pediatric patients, 23 embolization procedures were performed utilizing a combination of Onyx and coils. One patient underwent a single onyx embolization procedure while another had a single Onyx embolization in addition to 4 staged coiling procedures. Three patients had four staged Onyx embolizations, 2 with additional coiling procedures. Average estimated size reduction was 25%. Total obliteration was achieved in one patient. Two patients received adjuvant radiosurgery. No open surgical intervention was utilized. Clinical follow-up ranged from 7-12 months. We have angiographic follow-up of 6 and 7 months in two patients while 2 patients await repeat angiography. The patient with the atypical AVM died 24 hours after the fourth embolization procedure due to an intraventricular hemorrhage. Of the surviving patients, no new neurological deficits were noted.
Conclusions: Onyx is a feasible alternative embolization agent for intracranial AVMs in the pediatric population.

152. Severe Vasospasm After Intraventricular Hemorrhage From A Left Trigone Avm: Case Presentation And Review Of The Literature.
Huy Do, MD; Michael Edwards, MD; Michael Marks, MD; Lad Nanden, MD, PhD; Robert Dodd, MD, PhD; Arnett Klugh, MD; Raphael Guzman, MD; David Cornfield, MD, PhD (Stanford, CA)
Introduction: Cerebral Vasospasm after intracerebral hemorrhage from arteriovenous malformations (AVM) is a very rare entity and only few cases have been reported in the literature.
Methods: We present the history of a 13 year old boy who presented with a seizure and loss of consciousness. Initial CT scan revealed an intraventricular hemorrhage and a pineal mass. Subsequent MRI demonstrated characteristic flow voids in the left trigonal area with a large vein of galen varix accounting for the mass seen in the CT. After an initial uneventful recovery the patient developed a seizure and a right sided hemiparesis on day 8 after hemorrhage. MRI demonstrated an area of restricted diffusion in the left anterior cerebral artery (ACA) territory. Magnetic resonance angiography was suggestive of bilateral ACA vasospasm and transcranial Doppler studies revealed significantly elevated velocities. Catheter angiography the same day confirmed severe vasospasm in both ACA, bilateral terminal carotid artery and bilateral middle cerebral arteries treatment was started with intra-arterial nicardipine infusion. On 3 subsequent days the patient was taken back to the catheter lab for nicardipin.
Results: The patient made a good recovery with 4/5 strength in his right upper and lower extremity and was discharged for rehabilitation. Radiosurgery is planned for treatment of his AVM.
Conclusions: This case illustrates that cerebral vasospasm can occur after intraventricular hemorrhage from a ruptured AVM and has to be included in the differential diagnosis of a new stroke. Successful treatment with intraarterial nicardipine and balloon angioplasty can be achieved.

153. Spinal Cord Stimulation For Cancer Related Pain In An 11 Year Old Patient
Mariel Delgado, MD (Columbus, OH); Scott Elton, MD (Columbus Children's Hospital, OH)
Introduction: Epidural Spinal Cord Stimulators have been used extensively in adult populations for a wide range of applications including: Complex regional Pain syndrome I and II, Failed back syndrome, phantom limb pain, multiple sclerosis and a spinal cord injury syndrome . We report on a case of a 11 year old female patient with Ewing's Sarcoma diagnosed 2 years prior to implantation of the device.
Methods: Patient had tumor involvement of lumbar spine, sacrum and sacral nerve roots. She presented serious challenges in terms of pain control, requiring narcotics to the point of unresponsiveness. A Epidural Spinal Cord Stimulator was placed for treatment of intractable leg pain.
Results: Substantial improvement in pain control.
Conclusions: To the best of our knowledge this is the first reported case of Epidural Spinal Cord Stimulator placement for intractable cancer related pain in the pediatric population. This is a safe and effective way to treat pain and reduce narcotic use in the pediatric population with chronic pain secondary to malignancy who have failed other less invasive treatment modalities.

154. Endoscopic Endonasal Decompression Of The Sella For Visual Deficits In The Setting Of Pituitary Hypertrophy
Amin Kassam, MD; Elizabeth Tyler-Kabara, MD, PhD; Paul Gardner, MD; Daniel Prevedello, MD; Devin V. Amin, MD, PhD (Pittsburgh, PA)
Introduction: Pituitary hypertrophy in the setting of normal endocrine function can cause visual deficits by chiasmal compression in the setting of a congenitally small sella.
Methods: At our institution, three pediatric patients underwent endoscopic endonasal approach for sellar expansion and decompression of the optic chiasm. The preoperative evaluation included a full endocrine evaluation that did not reveal any dysfunction and an opthalmologic evaluation. The MR imaging in each caes demonstrated a homogenously enhancing pituitary gland compatible with pituitary hypertrophy. The removal of the bone anterior and inferior to the sella, as well as the tuberculum sella and an opening of the dura by an endoscopic transphenoidal route decompresses the optic chiasm by allowing the pituitary to descend into the space of the sphenoid sinus.
Results: The patients all experienced an improvement in their visual deficits and there were no new neurologic deficits. The average hospital stay was 2.3 days and no recurrence of visual deficits has occurred. The pathology evaluation demonstrated normal pituitary gland in each case.
Conclusions: The pituitary gland can potentially be a source of chiasmal compression in the abscence of pathology or endocrine dysfunction. The size of the sella appears to be a predisposing factor to the development of symptomatic visual deficits in the setting of puberty or other states of increased pituitary function.

155. Cortical Reorganization Following Perinatal Stroke And Implications For Hemispherectomy: A Functional Mri Study
Dennis W. Shaw, MD; Hillary A. Shurtleff, PhD; Jeffery Ojemann, MD; Gisele E. Ishak, MD; Jacob Zauberman, MD; Samuel R. Browd, MD, PhD; Leila Khorasani, MD; Mary H. Warner, PhD (Seattle, WA)
Introduction/Methods: Functional MRI was performed on four patients with congenital hemiparesis secondary to perinatal stroke to determine motor function during pre-surgical evaluation.
Results: fMRI motor activation was reorganized to atypical locations within the damaged hemisphere (DH) in all patients. In one patient Wada testing demonstrated complete contralateral hemiplegia during injection of the DH. One patient underwent surgical resection at another institution with subsequent improvement in the hemiparesis. fMRI was repeated post surgically. Activation in the intact hemisphere (IH) was increased compared to presurgical activation. Specifically, mirror movements were topographically mapped to two separate non-contiguous areas in the IH; findings not present pre-surgically.
Conclusions: Inhibition originating from the DH may affect corticospinal neurons (CSN) in the IH. Following resection, CSNs that project from the IH ipsilaterally to the paretic limb may be released from inhibition and provide the basis for improved motor control. Functional hemispherectomy may provide seizure freedom without functional deficits even in patients with demonstrated fMRI cortical activation in the DH.

156. Accidental Orbitocranial Penetrating Injuries In Children During Play

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Introduction: Penetrating orbitocranial injuries are a rare cause of cerebral trauma in children. The potential for unrecognized intracranial injuries and delayed complications, makes early diagnosis and appropriate follow up critical. We present the radiographic features, management and follow up of 7 cases.

Methods: We retrospectively searched trauma databases for two children's hospitals (Penn State Children's Hospital, and Connecticut Children's Medical Center). Hospital records and radiographs of 7 cases of penetrating orbitocranial trauma were identified and reviewed.

Results: Two females and five males with an average age of 7.6 years (range, 1 to 16 years), and follow up ranging from 6 months to 5 years wer identified. Various patterns of intracranial penetration were encountered, including two complete transcranial penetrations reaching the contralateral skull. One injury was apparent at the time of presentation, six were initially occult (including a transcranial penetration). One patient required immediate neurosurgical intervention for removal of the penetrating object, one required an ICP monitor, another had delayed surgical intervention for a retained foreign body, and four required no neurosurgical intervention. All patients with initially unrecognized intracranial penetration had emergent ophthalmologic evaluations. There were no deaths in this series, two delayed infectious complications, no delayed CSF leaks, and no delayed vascular complications.

Conclusions: Although orbitocranial penetrating injuries in children are rare, it is critical to recognize their presenting features. Potentially life threatening cranial penetrations can have occult presentations in children suffering seemingly trivial injuries. Heightened suspicion for these injuries, with appropriate imaging and follow-up are the keys to improved outcomes in these patients.

157. Orbitocranial Penetrating Trauma By A Tree Branch: Case Report And Literature Review

Clara R. Epstein, MD (Columbus, OH); Dongwoo J. Chang, MD,FRCS(C) (Sacramento, CA)

Introduction: Orbitocranial penetrating injury should be considered a neurosurgical emergency. Incomplete and/or delayed removal of a foreign body may lead to infectious and neurologic complications. A case report and relevant literature review is presented.

Methods: A 15-year-old boy sustained orbitocranial penetrating trauma from a tree branch when he ran into a tree while riding an all-terrain-vehicle. This clinical case, a relevant literature review and recommended technical approach is discussed.

Results: This problem was treated definitively with a frontotemporal craniotomy with a modified anterior skull base resection to fully extract the foreign body. A transcranial approach consisting of partial orbitotomy and radical sphenoid wing resection up to the most proximal portion of the anterior clinoid process was performed to obtain optimal exposure to complete the task.

Conclusions: The treatment approach should be tailored to the anatomic location of the foreign body penetration. In cases that involve the anterior and middle cranial compartments, it is necessary and beneficial to utilize a tailored skull base approach to extract the penetrating foreign bodies completely and avoid further injury to adjacent neurovascular structures.

158. The Lateral Lakes Of Trolard: Anatomy, Quantitation And Surgical Landmarks

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Introduction: There is scant and conflicting information in the literature regarding the lateral lacunae (lateral lakes of Trolard). As these venous structures can be encountered surgically, particularly in children, an anatomical study aimed at elucidating further their anatomy with quantitation and surgical landmarks for their identification seemed warranted.

Methods: Thirty-five adult cadavers underwent dissection of the lateral lacunae. Following quantitation of the lacunae, measurements were made of these structures and the distances from them to the coronal and sagittal sutures.

Results: A mean of 1.9 lacunae were identified on right sides and a mean of 1.4 lacunae were seen on left sides. The average length of the lacunae was 3.2 cm and 2.0 cm for right and left sides, respectively. The mean width of these venous lakes was 1.5 cm for right sides and 0.8 cm for left sides. Lacunae were variably positioned but tended to cluster near the vertex of the skull. No lacunae were identified posterior to the lambdoid sutures and only five lacunae were found to lie anterior to the coronal suture. When lacunae were identified anterior to the coronal suture, they were generally 5 to 6 cm from this structure.

Conclusions: Although variable, the lateral lacunae are concentrated posterior to the coronal suture and anterior to the lambdoid sutures. The lacunae are most often found within 3 cm of the sagittal suture. These data not previously reported, may be useful to the neurosurgeon in surgical planning for procedures that traverse the calvaria.

159. The Choroid Plexus Of The Lateral And Third Ventricles Is Contiguous: A Surgical Anatomic Study

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Introduction: Descriptions of the velum interpositum (VI) are typically brief and lacking detail in most neuroanatomical and neurosurgical texts. As this structure may be involved clinically or encountered surgically, the present study seemed warranted.

Methods: Twenty adult (ten male and ten female) formalin fixed and fresh cadaveric brains underwent a detailed dissection of the VI via an interhemispheric transcollosal approach. Observations were made of the attachment sites and continuation of the VI. Measurements were made of its length and width at its anterior, midportion, and posterior parts.

Results: The VI extended laterally over the thalami to become continuous with the choroid plexus of the lateral ventricles. At a point along the thalami where the choroid plexus was found, the VI became "tacked" down and thus continuous with the choroid plexus subependymally. No specimen exhibited a separate choroid plexus of the third ventricle. In each, the choroid plexus of the lateral and third ventricles were the same tissue layer, all arising from the VI. This membrane was confluent with the pia/arachnoid over the cerebellum and from the inferior surface of the parietal/occipital lobes and extended laterally into the choroid fissure.

Conclusions: The supratentorial choroid plexus is simply a vascular extension of the VI. There is no separate choroid plexus of the third ventricle such as is often described. Clear planes exist between the VI and surrounding structures such as the pineal gland. Such data may be useful to neurosurgeons who operate in this region and to clinicians who interpret imaging in the area of the VI.

160. Telemedicine: The Use Of Cell Phone Pictures In Pediatric Neurosurgery

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Introduction: Advances in the medical field have largely followed advances in technology. Medical strides have been taken when physicians and researchers have adapted growing science to target specific problems. Just as the information superhighway linked businesses from distant lands, the medical world is now connected. A new medical field, known as telemedicine, has emerged linking physicians with colleagues and patients. Cell phone technology is now affordable for almost everyone and basic models include digital photography. We present a case report exhibiting the utility of digital pictures taken with a patient's cell phone.

Methods: Wound checks were carried out using the digital photography function on the patient's cell phone and these images were transmitted to the surgeon via text messaging and emails.

Results: Our patient had a wound infection requiring daily intravenous antibiotics. In years past, this patient would have required a prolonged hospitalization. In the days of managed care, patients with these infections are discharged from the hospital, but close outpatient observation is required to monitor the wound. Our patient lived over 3 hours away from the hospital. Daily appointments for wound checks in the clinic would have been an impossible.The wound was able monitored via cell phone images without the travel inconvenience and expense along with clearing up appointments in the clinic for patients with new neurosurgical issues.

Conclusions: This application of cell phone technology has been documented previously in the literature and should attain greater stature as a legitimate method for close outpatient observation.

161. Secondary Endoscopic Third Ventriculostomy Provides Long Term Control of Hydrocephalus

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Introduction: In patients with endoscopic third ventriculostomy (ETV) as primary intervention in the treatment of hydrocephalus (HCP), the role for secondary ETV (SETV) in the setting of ETV failure is less well defined. The authors discuss 1) the rate of success defined by control of hydrocephalus and shunt freedom, and 2) examples of SETV performed at their institution including clinical course and surgical anatomy as it relates to decision making.

Methods: The authors reviewed the office charts and hospital imaging system at the Children's Hospital of Alabama from 1996 to 2007 and identified 5 patients that had been diagnosed with ETV failure who underwent SETV. Indications for interventions included increase in ventricular size, recurrence of preoperative symptoms, or headache concerning for raised ICP. Details of the third ventricular floor anatomy were noted as well.

Results: Of the 5 patients who underwent SETV, all remain shunt free. Median follow up from the second operation was 51 months. Median time between operations was 16 months. Etiologies of HCP included tectal plate glioma (3), pineal region tumor (1), and arachnoid cyst (1). Scarring over of the initial third ventriculostomy fenestration appeared to be the etiology of ETV failure in 3 patients, a focal blood clot in another, and patulous prepontine arachnoid adhesions in another.

Conclusions: SETV is a successful option in the setting of ETV failure. As in all patients with hydrocephalus, serial follow up is required.

162. Arachnoid Cysts: A Diffuse Spinal Fluid Absorption Abnormality?

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Introduction: Cerebrospinal fuild (CSF) homeostasis is quite complex, and does not always present in a diffuse form such as hydrocephalus. In some situations, a focal manifestation of this global circulation abnormality is identified, such as arachnoid cysts (most often in the temporal fossa). These patients with temporal arachnoid cysts develop shunt dependency as spinal fluid circulation seems to be affected permanently.

Methods: 7 patients (ages 4-16 years) were initially treated with craniotomy (2 endoscopic) and cyst fenestration for temporal arachnoid cysts (measuring 4-8cm. In size), but eventually required a shunt for drainage. Four of these children presented with subdural hemorrhage after rupture of the arachnoid cysts, presenting with signs of increasing intracranial pressure. Despite decreasing cyst size, all the patients developed a form of shunt dependency, requiring shunt revisions for malfunction. Ventricular enlargement was not seen during these episodes, and repeat attempts to fenestrate the cysts were not successful. Multiple shunt revisions (average 4.5) were often required before symptom resolution.

Results: Some patients with diffuse cerebrospinal fluid circulation abnormalities present with focal cystic accumulation of CSF arachnoid cysts, and focal drainage or communication may not be adequate to relieve symptoms. A diffuse spinal fluid absorption abnormality (similar to pseudotumor cerebrii, or form fruste of hydrocephalus) may be focally expressed, suggesting another etiology or treatment option might be indicated.

Conclusions: Arachnoid cysts may represent a focal expression of an underlying global cerebrospinal fluid absorption problem.

163. The Mechanical Integrity Of Programmable Valves After Repeated MR Imaging

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Introduction: With growing interest in the use of MR imaging in place of CT imaging to minimize pediatric patient exposure to radiation and anecdotal accounts of valve failure after repeated exposures to magnetic field (1), we are investigating the mechanical integrity of programmable valves after repeated MR imaging.

Methods: Two externally adjustable differential programmable valves, the Codman-Hakim (Codman & Shurtleff Inc.) and Strata (Medtronic Inc.), are studied under three conditions (control, reprogramming of the valve after exposure to MR imaging, and reprogramming of the valve without exposure to MR imaging) for 30 cycles.

Results: The effect of repeat exposure to a magnetic field and reprogramming are being evaluated by calculation of both flow rate and concurrent pressure.

Conclusions: All mechanical devices have a structural integrity. We are interested in the amount of mechanical stress programmable valves can endure prior to failure. The results of this study will address a logistical hurdle in using MR imaging in place of CT in the management of shunt dependent pediatric patients.

Reference: Ortler, M; Kostron, H; Felber S. Transcutaneous pressure-adjustable valves and magnetic resonance imaging: an ex vivo examination of the Codman-Medos programmable valve and the Sophy adjustable pressure valve. Neurosurgery. Feb 1998. 42(2):430.

164. Safer Removal Of Ventricular Catheters With Ingrown Choroid Plexus: Progress Toward A New Device

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Introduction: Ventricular cathter occlusion is common in shunts, and the risk of hemorrhage in ventricular catheter removal and tissue or vascular damage with monopolar electrocautery prior to removal are significant. We therefore developed a bipolar electrocautery device intended to more safely manage shunt revision.

Methods: We performed comparison between bipolar and currently used monopolar treatment in in vitro coagulation assays with ovalbumin and tissue damage assays with muscle. Further, we developed a computer model of the temperature and damage distribution during monopolar and bipolar electrocoagulation in order to test whether the bipolar device is more spatially restricted in its thermoelectric impact on surrounding vascular tissue.The electric field and the heat transfer are calculated by the Finite Element Method. The model considers the change of tissue and fluid parameters due to the heating process.

Results: Ovalbumin coagulation was achieved with lower energy levels with the bipolar electrode (an order of 30.8 ± 7.7 versus 375 ± 95.7 J), and the overall coagulum was smaller, suggesting that the electrical current and resultant heating is more focused in the bipolar electrode than the monopolar-energized stylet. Also, lesions in chicken muscle were more restricted with the bipolar electrode. The model considers the change of tissue and fluid parameters due to the heating process.

Conclusions: These experiments demonstrate that a bipolar electrode design is a safer means for coagulating shunt-occluding tissue than current monopolar practice, since its effects are more spatially restricted. These results further suggest that postsurgical morbidity could be reduced with the adoption of bipolar electrocautery.

165. Endovascular Treatment Of Aneurysmal Bone Cysts Using Onyx In The Pediatric Population

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Introduction: Selective arterial embolization has been reported to be a safe and effective therapy for pediatric aneurysmal bone cysts. Newer liquid embolic agents confer more permanent vascular occlusion thus reducing the possibility of recanalization and possibly the high rate of recurrence reported in these lesions. In this report, we describe the use of Onyx® (ethelyne-vinyl-alcohol), a newer embolic agent, for the embolization of pediatric aneurysmal bone cysts. We believe that Onyx confers several advantages over other liquid embolics.

Methods: Two cases of pediatric aneurysmal bone cysts are presented, one lesion was located in the posterior elements of C2 and the other was located in the posterior aspect of the mastoid bone. Each lesion had a significant vascular supply as demonstrated by catheter angiography. The vascular supply to both lesions was catheterized without difficulty and embolized with Onyx-18.

Results: Embolization of both aneurysmal bone cysts with Onyx resulted in a significant reduction in the vascular supply of the lesions without neurological complications. The aneurysmal bone cysts were then resected one day after embolization and there was minimal blood loss in each case. With at least a two year follow up there has been no evidence of recurrence.

Conclusions: Onyx is a non-absorbable, non-adhesive embolic agent that can be safely and effectively used in the embolization of pediatric aneurysmal bone cysts. The advantage of using Onyx in the pediatric population is the potentially decreased risk profile of the embolic agent while at the same time providing durable vascular occlusion and potentially decreasing the rate of recurrence.

166. Neuroleptic Malignant Syndrome From Central Nervous System Insult: 4 Cases And A Novel Treatment Strategy

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Introduction: Neuroleptic malignant syndrome (NMS) is a potentially life-threatening entity characterized by hyperthermia, autonomic deregulation, decreased mental status, increased muscle tone, and often renal failure due to rhabdomyolysis. Classically, it follows administration of anti-psychotic medication. We report 4 patients (2 pediatric, 2 adult) who were diagnosed with NMS following central nervous system insult. No patient was receiving anti-psychotic medication. We also present a novel treatment strategy.

Methods: A retrospective chart review was performed utilizing hospital and clinic charts, radiographic data, and telephone conversation with the patients.

Results: All 4 patients met diagnostic criteria for neuroleptic malignant syndrome. Three patients presented in shunt failure and one patient was 2 days postop from a functional hemispherectomy. The diagnosis was made in retrospect in 1 of the shunt failure patients. An endoscopic third ventriculostomy alleviated his shunt failure and he remains free of NMS. The other 2 shunt patients underwent treatment for their shunt failure but NMS remained. These 2, and the hemispherectomy patient underwent a trial of intrathecal baclofen with resolution of their NMS. Subsequently baclofen pump insertion was performed in all 3 with resolution of their NMS. The 2 patients in shunt failure had lumbar baclofen pumps. The hemispherectomy patient had an intracranial baclofen catheter.

Conclusions: NMS is a life-threatening, rare disorder which can present in the absence of neuroleptic administration. Alleviation of any CNS insult is the first order of treatment. Some patients with persistent symptoms of NMS may benefit from intrathecal baclofen delivery.

167. Pediatric Spinal Clear Cell Meningiomas: A Case Report And Literature Review

Steven Ham, DO; Chaim B. Colen, MD, PhD; Mahmoud Rayes, MD; William J. Kupsky, MD (Detroit, MI)

Introduction: To demonstrate a unique case of spinal clear cell meningioma in a pediatric patient. Spinal clear cell meningioma (CCM) is rare. Fourteen cases of pediatric clear cell meningioma occurring in the spinal canal have been reported. To our knowledge, our paper is the first report use of adjuvant local radiotherapy after gross total resection of spinal CCM in a pediatric patient with no local or distant recurrence.

Methods: A 13 year old-female presented with pain radiating down her left leg. MRI showed an inhomogeneous enhancing intradural-extramedullary mass at the L4-L5 level.

Results: Surgical resection revealed clear cell meningioma. Radiotherapy was administered. Postoperatively there has been no recurrence in over 2 years.

Conclusions: This paper reports a case of clear cell meningioma and provides a comprehensive literature review on CCM. Current recommendations for management are still debatable, especially in the pediatric population, and we propose an algorithm for its treatment and surveillance.

168. Positional Csf Pressure Recording As A Tool In Assessing Diseases Of Csf Dynamics

Daniel J. Curry, MD; Rudolfo Hakim, MD (Chicago, IL)

Introduction: In normal subjects the CSF pressure, measured at different degrees of body inclination, changes minimally when the manometer is referenced at the heart level. When referenced at the ear level, the CSF pressure decreases as the inclination of the body increases. In disease states pressure patterns manifest differently.

Methods: Lumbar punctures were done on 10 patients with different diagnoses to assess the variations in CSF pressure dynamics with postural changes. Under general endotracheal anesthesia, ten patients, ages 2 - 18 years, were positioned on lateral decubitus over a cardiac tilt table. The CSF pressures were measured by zero-referencing the manometer at two locations: at the heart level and at the ear level. Pressures were recorded at 0, 30, 45 and 90 degrees of inclination.

Results: The patients with shunt obstruction/ hydrocephalus showed an increasing CSF pressure with inclination.The patients with pseudo tumor showed a pattern of increasing CSF pressure values at the heart and decreasing pressures at the ear with inclinication.The patients with adequately functioning VP shunts showed no csf pressure variations at the level of the heart with inclincation while at the level of the ears it decreased proportionally with inclination. Patients with arachnoid cysts showed a slightly increaseing CSF pressures at the level of the heart with inclinication and a decrease in value when measured at the ear.

Conclusions: Abnormal CSF pressure values at different degrees of body inclination are observed in patients with alterations in CSF dynamics. This technique can be used to assess in the treatment decisions for these patients.

169. Siphon Factor: A Simple Measurement To Quantify Siphon Compensation In Peritoneal-terminus Shunt Design

Daniel J. Curry, MD; Rudolfo Hakim, MD (Chicago, IL)

Introduction: Ventriculoperitoneal shunts are life-saving devices in the treatment of hydrocephalus but they can create non-physiologic CSF dynamics since they bypass the pressure regulatory effects of the heart. Differential pressure valves will begin to siphon when gravity pulls the CSF down the shunt as the patient stands. This chronic over-drainage can lead to slit ventricle syndrome and multiple shunt revisions. Siphon limiting systems exists, but their efficacy is dependent upon the anti-siphon effect matching the magnitude of the siphon. We propose a simple method for estimating the magnitude of the siphon effect.

Methods: Six patients with shunted hydrocephalus presented with shunt malfunction and a chronic history consistent with shunt over-drainage. All patients underwent shunt revision and had gravity-actuated siphon-limiting device placed that approximated the siphon factor. The siphon factor was calculated by measuring the distance from the tricuspid valve to the symphasis pubis and subtracting 8cm (average abdominal pressure). The tricuspid position was defined as a point one quarter of the sternum-manubrium distance from the sternum-xiphoid junction.

Results: Five of the six patients had improvement of their chronic over-drainage symptoms. Five of the six patients had improved or stable ventricular morphology on serial head CT.

Conclusions: The siphon factor is a theoretical, simple calculation that may assist the neurosurgeon in the matching the anti-siphon system to a particular patients siphon magnitude. The Siphon factor is a theoretical tool that requires validation in a large shunted population with pressure measurements and decade-long follow-up to assess the ability of the technique to prevent slit ventricle syndrome.

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2007 AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY ANNUAL MEETING

Name ID NUMBER

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 are appreciated.

SCIENTIFIC SESSIONS – WEDNESDAY, NOVEMBER 28TH, 2007

Session Details: Scientific Sessions I - V	Rating Scale: Excellent		Average		Poor
1. The quality of the Oral Abstract Presentations were:	A	B	C	D	E
2. Topics were addressed completely.	A	B	C	D	E
3. Content was relevant to my practice.	A	B	C	D	E
4. There was sufficient opportunity for questions/discussion.	A	B	C	D	E

5. What did you learn in these sessions that you will apply to your practice?

6. Overall, how could these sessions be improved?

7. Did you perceive any commercial bias during these sessions? Yes No

If yes, please explain

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

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SCIENTIFIC SESSIONS – THURSDAY, NOVEMBER 29TH, 2007

Session Details: Scientific Sessions VI	**Rating Scale**				
	Excellent		**Average**		**Poor**
1. The quality of the Oral Abstract Presentations were:	A	B	C	D	E
2. Topics were addressed completely.	A	B	C	D	E
3. Content was relevant to my practice.	A	B	C	D	E
4. There was sufficient opportunity for questions/discussion.	A	B	C	D	E

5. What did you learn in these sessions that you will apply to your practice?

6. Overall, how could these sessions be improved?

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SCIENTIFIC SESSIONS – THURSDAY, NOVEMBER 29TH, 2007

Session Details: Raimondi Lecture, Scientific Session VII - VIII	Rating Scale: Excellent		Average		Poor
1. The quality of the Oral Abstract Presentations were:	A	B	C	D	E
2. Topics were addressed completely.	A	B	C	D	E
3. The quality of the Raimondi Lecture by Dr. Roberto Heros.	A	B	C	D	E
4. Content was relevant to my practice.	A	B	C	D	E
5. There was sufficient opportunity for questions/discussion.	A	B	C	D	E

6. What did you learn in these sessions that you will apply to your practice?

7. Overall, how could these sessions be improved?

8. Did you perceive any commercial bias during these sessions? Yes No

If yes, please explain

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SCIENTIFIC SESSIONS – THURSDAY, NOVEMBER 29TH, 2007

Session Details: 3D Anatomy of the Brainstem	Rating Scale: Excellent		Average		Poor
1. The quality of the Special Lecture was:	A	B	C	D	E
2. The quality of the speaker was.	A	B	C	D	E
3. The quality of the Oral Abstract Presentations were.	A	B	C	D	E
4. Topics were addressed completely.	A	B	C	D	E
5. Content was relevant to my practice.	A	B	C	D	E
6. There was sufficient opportunity for questions/discussion.	A	B	C	D	E

7. What did you learn in these sessions that you will apply to your practice?

7. Overall, how could these sessions be improved?

8. Did you perceive any commercial bias during these sessions? Yes No

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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 are appreciated.

SCIENTIFIC SESSIONS – THURSDAY, NOVEMBER 29TH, 2007

Session Details: Career Paths in Neurosurgery	Rating Scale: Excellent		Average		Poor
1. The quality of the Special Lecture was:	A	B	C	D	E
2. The quality of the faculty were.					
a. Stephen Huhn, MD	A	B	C	D	E
b. Glenn Morrison, MD	A	B	C	D	E
c. Jeffrey Wisoff, MD	A	B	C	D	E
3. The quality of the Oral Abstract Presentations were.	A	B	C	D	E
4. Topics were addressed completely.	A	B	C	D	E
5. Content was relevant to my practice.	A	B	C	D	E
6. There was sufficient opportunity for questions/discussion.	A	B	C	D	E

7. What did you learn in these sessions that you will apply to your practice?

7. Overall, how could these sessions be improved?

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2007 AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY ANNUAL MEETING

Name ID NUMBER

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 are appreciated.

SCIENTIFIC SESSIONS – FRIDAY, NOVEMBER 30TH, 2007

Session Details: Scientific Session IX - XI	Rating Scale: Excellent		Average		Poor
1. The quality of the Oral Abstract Presentations were:	A	B	C	D	E
2. Topics were addressed completely.	A	B	C	D	E
3. Content was relevant to my practice.	A	B	C	D	E
4. There was sufficient opportunity for questions/discussion.	A	B	C	D	E

5. What did you learn in these sessions that you will apply to your practice?

6. Overall, how could these sessions be improved?

7. Did you perceive any commercial bias during these sessions? Yes No

If yes, please explain

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

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SAVE THE DATE FOR 2008!

2008 AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY ANNUAL MEETING

December 3-6, 2008
The Davenport Hotel
Spokane, Washington

American Association of Neurological Surgeons

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