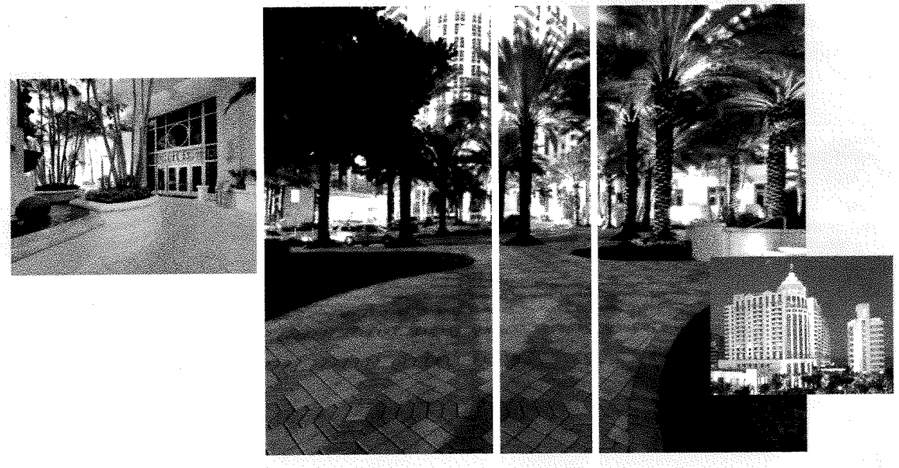
SAVE THE DATE FOR 2007

2007 AANS/CNS Section on Pediatric Neurological Surgery Annual Meeting

November 27–December 1, 2007
The Loews Miami Beach Hotel
South Beach (Miami), Florida



Jointly Sponsored by the AANS

American Association of Neurological Surgeons

Flannery

2006
Program Book

The 35th Annual Meeting of the AANS/CNS Section on Pediatric Neurological Surgery

November 28–December 1
Denver Marriott City Center
Denver, Colorado

The Program Book is Sponsored in Part by an Educational Grant Provided by Codman, a Johnson & Johnson company

Codman
a Johnson & Johnson company

Jointly Sponsored by the AANS

American Association of Neurological Surgeons

AANS/CNS Section on Pediatric Neurological Surgery

November 28 – December 1, 2006
Denver, Colorado

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 27.0 *AMA PRA Category 1 Credit(s).*™ Physicians should only claim credit commensurate with the extent of their participation in the activity.

Joint Sponsorship Disclaimer

The material presented at the 2006 AANS/CNS Section on Pediatric Neurological Surgery Annual Meeting has been made available by the AANS/CNS Section on Pediatric Neurological Surgery and the AANS for educational purposes only. The material is not intended to represent the only, nor necessarily the best, method or procedure appropriate for the medical situations discussed, but rather it is intended to present an approach, view, statement or opinion of the faculty, which may be helpful to others who face similar situations.

Neither the content (whether written or oral) of any course, seminar or other presentation in the program, nor the use of 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.

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

TABLE OF CONTENTS

DATE

National Center for Health Statistics
ICD-9-CM Coordination and Maintenance Committee
3311 Toledo Road, Room 2402
Hyattsville, Maryland 20782

Fax: (301) 458-4022

Re: Proprosal for a new ICD-9-CM Code (331.5) for normal pressure hydrocephalus

Dear Sirs/ or Madam

I am writing to express my personal support for the creation of a new ICD-9-CM code for normal pressure hydrocephalus (331.5) as presented to the ICD-9-CM Coordination and Maintenance Committee on March 24, 2006.

As a NEUROSURGEON/~~NEUROLOGIST~~ who cares for many patients with hydrocephalus, and who recognizes the importance of proper coding for diagnostic, epidemiologic, and research purposes, I believe the creation of a new code for NPH is timely and critical.

In terms of the coding itself, I think it is preferable to have a 4-digit code (331.5) for NPH rather than a fifth digit code for 331.3, as it is clear from the 2005 NPH consensus guidelines that NPH is a distinct clinical entity.

Thank you for your consideration.

Sincerely,

The 35th Annual Meeting of the AANS/CNS Section on Pediatric Neurological Surgery Program Book Addendum

Thank you to the following individuals who graded the abstract submissions

Neil A. Feldstein, MD, FACS
Paul A. Grabb, MD
Joseph R. Madsen, MD
David W. Pincus, MD, PhD
John Ragheb, MD
Shenandoah Robinson, MD
Mark M. Souweidane, MD

Wednesday, November 29, 2006

Scientific Session III: General Interest
10:42 – 10:54 AM
12. Surgical Management of Atlanto-axial Instability in Children
Likhith Alakandy, FRCS presenting

Thursday, November 30, 2006

Scientific Session VIII: Tumor II
3:15 – 3:27 PM
55. Abnormal Diffusion Characteristics in Pediatric Supratentorial Brian Tumor, a DTI Study
Weihong Yuan, PhD presenting

Earn Additional CME with these two 1 hour courses that have recently been added to the AANS/CNS Section on Pediatric Neurological Surgery Annual Meeting

On Wednesday, November 29th at 5:30 - How to Write Questions for SANS with Hugh Garton, MD and Corey Raffel, MD, PhD

Gold Coin Room

The AANS/CNS Section on Pediatric Neurosurgery has been asked by the editors of SANS to provide pediatric neurosurgery questions for their learning tool/exam. Many of the questions from SANS end up on the ABNS written and MOC exams. A meeting is being held at this year's Annual Meeting for those interested in writing questions for SANS. Question writing is an art and attendees will be introduced to the format and techniques needed for writing good questions. Hopefully, after attending this information and instruction session, section members will be prepared to submit a large number of questions to SANS.

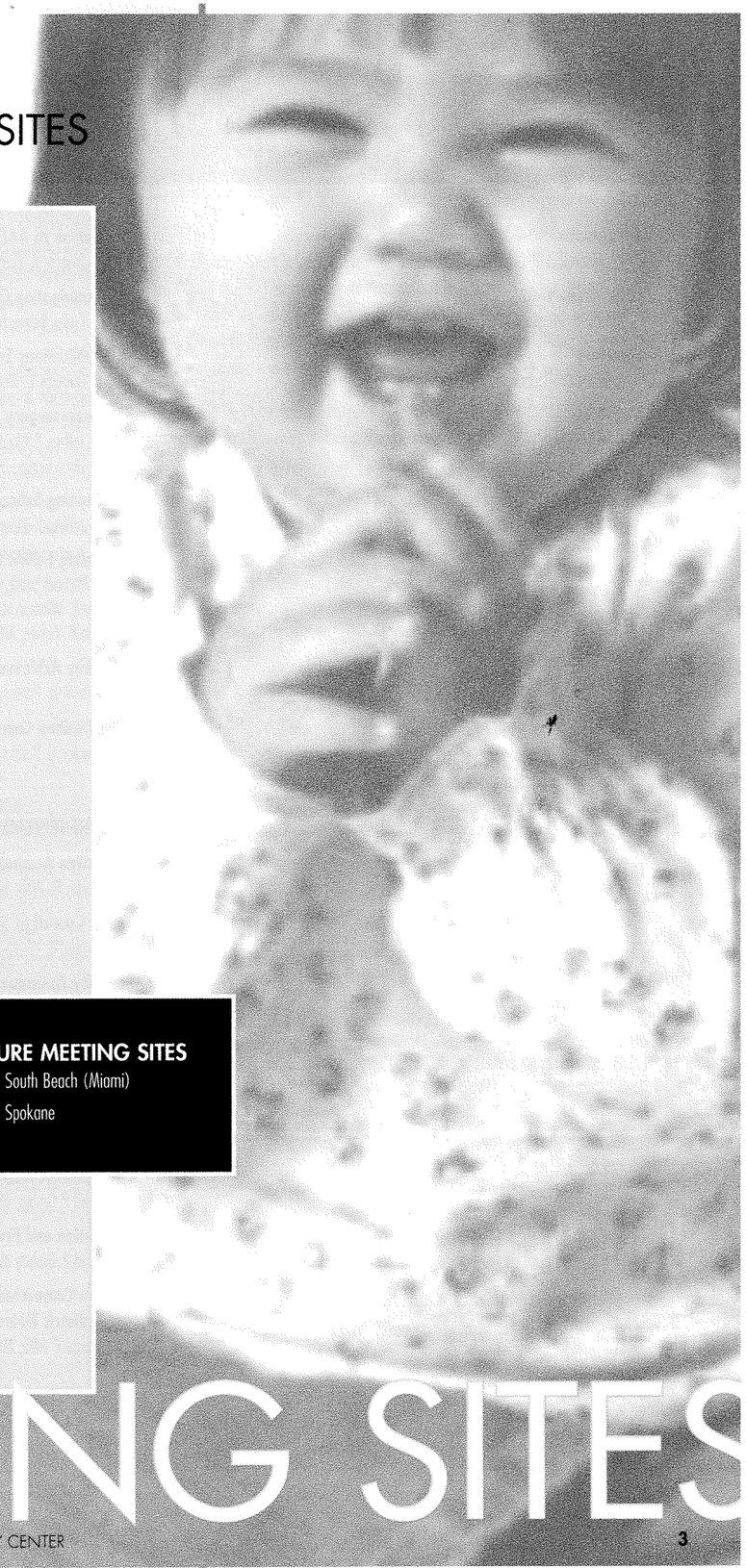
On Thursday, November 30th at 6:00 pm - Congenital Neurosurgeons: Transitioning Children with Hydrocephalus into the Adult Medical World with Harold L. Rekate, MD

Gold Coin Room

Finding colleagues and committed pediatric specialists who are interested in the unique problems of young adults that have graduated from care in children's hospitals is one of the major challenges that is facing systems that deliver health care. For example, more adults than children are being operated upon for problems related to congenital heart disease. The American Academy of Pediatrics has identified this problem as a major concern. There will be an organizational meeting at the annual meeting of the Joint Section on Pediatric Neurological Surgeons in Denver this year to explore how those of us who remain interested in the care of grownups with pediatric neurosurgical problems can network and determine whether there is any interest in defining a group of "congenital neurosurgeons."

Please stop by on-site registration if you are interested in being part of these two exciting sessions.

ANNUAL MEETING SITES



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
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

FUTURE MEETING SITES
2007 South Beach (Miami)
2008 Spokane

MEETING SITES

JOINT SECTION OF PEDIATRIC NEUROLOGICAL SURGERY OFFICERS AND COMMITTEES 2006

Chairperson
Rick Abbott, MD (2005)

Chairperson-Elect
Jeffrey H. Wisoff, MD (2005)

Secretary
Ann-Christine Duhaime, MD (2005)

Treasurer
Alan R. Cohen, MD, FACS (2005)

Members at Large
Bruce A. Kaufman, MD (2005)
Nalin Gupta, MD, PhD (2005)
Jeffrey P. Blount, MD, FACS (2006)

STANDING COMMITTEES

Nominating Committee:
Andrew D. Parent, MD, (Chairperson) (2005)
Thomas G. Luerssen, MD (2003)
Marion L. Walker, MD, FACS (1999)

Rules and Regulations Committee:
Cheryl A. Muszynski, MD, FACS (Chairperson) (2002)
Michael Vassilyadi, MD (2005)
Nathan R. Selden MD, PhD (2004)

Membership Committee:
John R.W. Kestle, MD (Chairperson) (2004)

AD HOC COMMITTEES

Education Committee
Paul Steinbok, MD (Chairperson) (2006)

Program and Continuing Medical Education Subcommittee
Joseph R. Madsen, MD, Chairperson (2004)
Sarah J. Gaskill, MD, FACS Vice-Chairperson (2006)
Michael H. Handler, MD, FACS (Denver, 2006)
John Ragheb, MD (Miami, 2007)
David P. Gruber, MD (Spokane, 2008)
Liliana C. Goumnerova, MD, FRCS(C) (Boston, 2009)

ISPN Liaison
George I. Jallo, MD (2006)

ASPN Liaison
Liliana C. Goumnerova, MD, FRCS(C) (2006)

Liaison to AAP Section of Neurological Surgery (SONS)
Joseph H. Piatt, Jr., MD (2006)

Examination Questions Subcommittee
Corey Raffel, MD, PhD (2006)

Publications Subcommittee
Douglas L. Brockmeyer, MD (2006)

Neurosurgery On-Call Subcommittee
Jeffrey P. Blount, MD (2006)
Nalin Gupta, MD, PhD (2006)

Training Subcommittee
Jeffrey P. Blount, MD (2006)

Traveling Fellowship:
R. Michael Scott, MD (Chairman)
Ken R. Winston II, MD
Alan R. Cohen, MD

Lifetime Achievement Award:
Andrew D. Parent, MD (Chairman) (2005)

Publications Committee:
Douglas L. Brockmeyer, MD (Chairman) (2006)

REPRESENTATIVES AND LIAISONS

American Academy of Pediatrics:
Joseph H. Piatt, Jr., MD (1997)

Joint Council of State Neurosurgical Societies:
Michael D. Heafner, MD (1999)

Quality Assurance Committee:
Paul A. Grabb, MD (1999)
Sarah J. Gaskill, MD (1999)
James M. Drake, MD (1999)

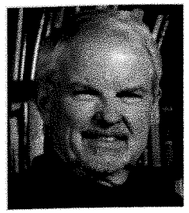
Washington Committee, AANS/CNS
Andrew D. Parent, MD (2005)

Coding and Reimbursement Committee
Frederick A. Boop, MD (2004)
David P. Gruber, MD (2006)

Education and Practice Management Committee, AANS
David P. Gruber, MD (2003)

Liason Committee, International Society for Pediatric Neurosurgery
George I. Jallo, MD (2006)

2006 RAIMONDI LECTURER



RICHARD D. LAMM

Richard D. Lamm is Co-Director of the Institute for Public Policy Studies at the University of Denver, and the former three-term Governor of Colorado (1975-1987). He is both a lawyer (Berkeley, 1961) and a Certified Public Accountant. He joined the faculty of the University of Denver in 1969 and has, except for his years as Governor, been associated with the University ever since.

Lamm was Chairman of the Pew Health Professions Commission and a public member of the Accreditation Council for Graduate Medical Education. He is the author of numerous articles on health care, which have appeared in such medical publications as *The Journal of the American Medical Association (JAMA), Health Affairs, Medical Economics* and *Public Health Reports*. He is a consultant to the National Conference of State Legislatures' Health Priorities Project and Co-Chair of the Health Care Priorities Planning Group through the NCSL, The Hastings Center and the Center for Public Policy and Contemporary Issues at the University of Denver. His book, ***The Brave New World of Healthcare*** (Fulcrum Press, 2004) is an exposé of healthcare policy in the United States. His latest book is ***Two Wands, One Nation: An Essay on Race and Community in America*** (Fulcrum Publishing, January 2006).

Lamm has appeared on virtually every national news program, including Buchanan & Press (MSNBC), Larry King Live and Inside Politics (CNN), Today (NBC), Meet the Press (NBC), ABC's Good Morning America, Lehrer NewsHour (PBS) and CBS's Face the Nation. His editorials have appeared in the San Francisco Chronicle, New York Times, Christian Science Monitor, Newsday, Boston Globe, Los Angeles Times and Chicago Tribune, as well as in a number of academic and medical journals.

The Institute for Public Policy Studies at the University of Denver comprises the Public Affairs Program (Bachelor's in Public Affairs), the Graduate Program in Public Policy (Master's in Public Policy, MPP), and the Center for Public Policy and Contemporary Issues. In addition to directing the University of Denver's academic policy programs, the Institute for Public Policy Studies contributes to the study and discussion of American society's most critical issues through an active program of conferences, seminars, forums and publications.

RAIMONDI LECTURERS

1978	E. Bruce Hendrick	1988	Joseph J. Volpe	1998	Robert A. Zimmerman
1979	Paul C. Bucy	1989	Martin Eichelberger	1999	David B. Schurtleff
1980	Floyd Gilles	1990	George R. Leopold	2000	Steve Berman
1981	Panel Discussion	1991	Judah Folkman	2001	Alejandro Berenstein
1982	Panel Discussion	1992	Olof Flodmark	2002	Volker K.H. Sonntag
1983	Derek Harwood-Nash	1993	Maurice Albin	2003	Jon Huntsman
1984	Anthony E. Gallo, Jr.	1994	Blaise F.D. Bourgeois	2004	J. Michael Bishop
1985	Frank Nulsen	1995	Robert H. Pudenz	2005	James B. McClintock, PhD
1986	William F. Meacham	1996	Samuel S. Flint	2006	Richard D. Lamm
1987	Dale Johnson	1997	M. Michael Cohen, Jr.		

MATSON MEMORIAL LECTURERS

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

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 Ventricultis

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. MEADOW** Posture Independent Piston Valve: A Practical Solution to Maintaining Stable Intracranial Pressure in Shunted Hydrocephalus

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

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

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 E. MEADOW** Quick Brain MRI vs. CT Scan for Evaluating Shunted Hydrocephalus

and

JONATHAN MILLER Abberant Neuronal Development in Hydrocephalus

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

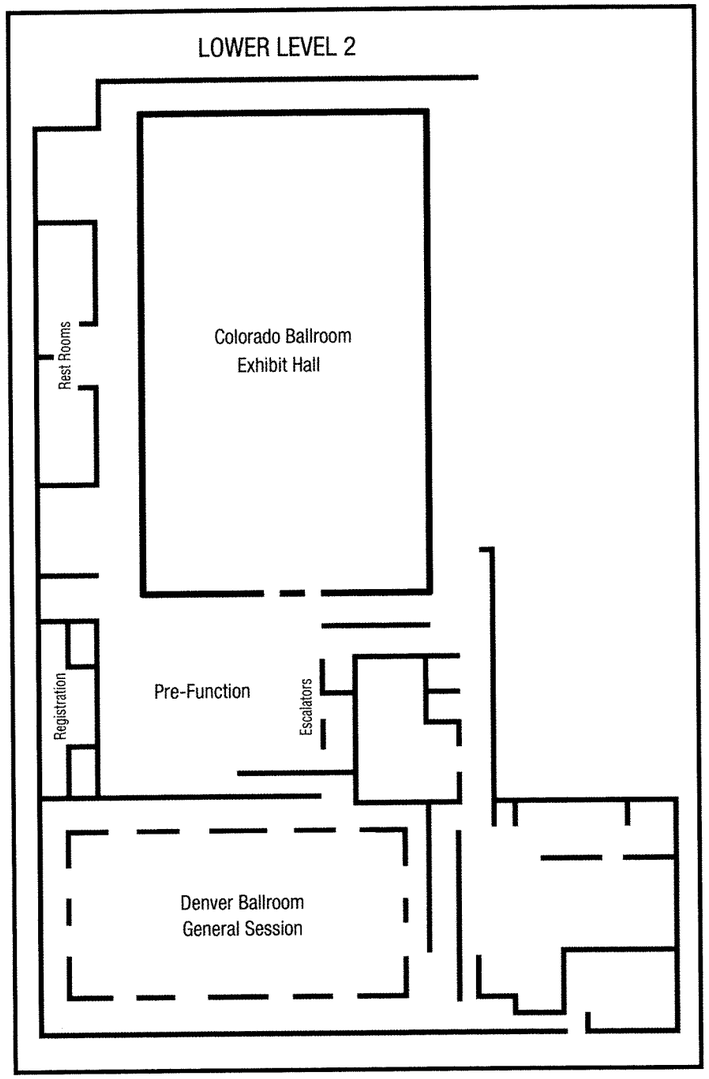
2004 **JEFF PUGH** Can the Skull Diploic Space Be Utilized for Absorption of Cerebrospinal Fluid?

and

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

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

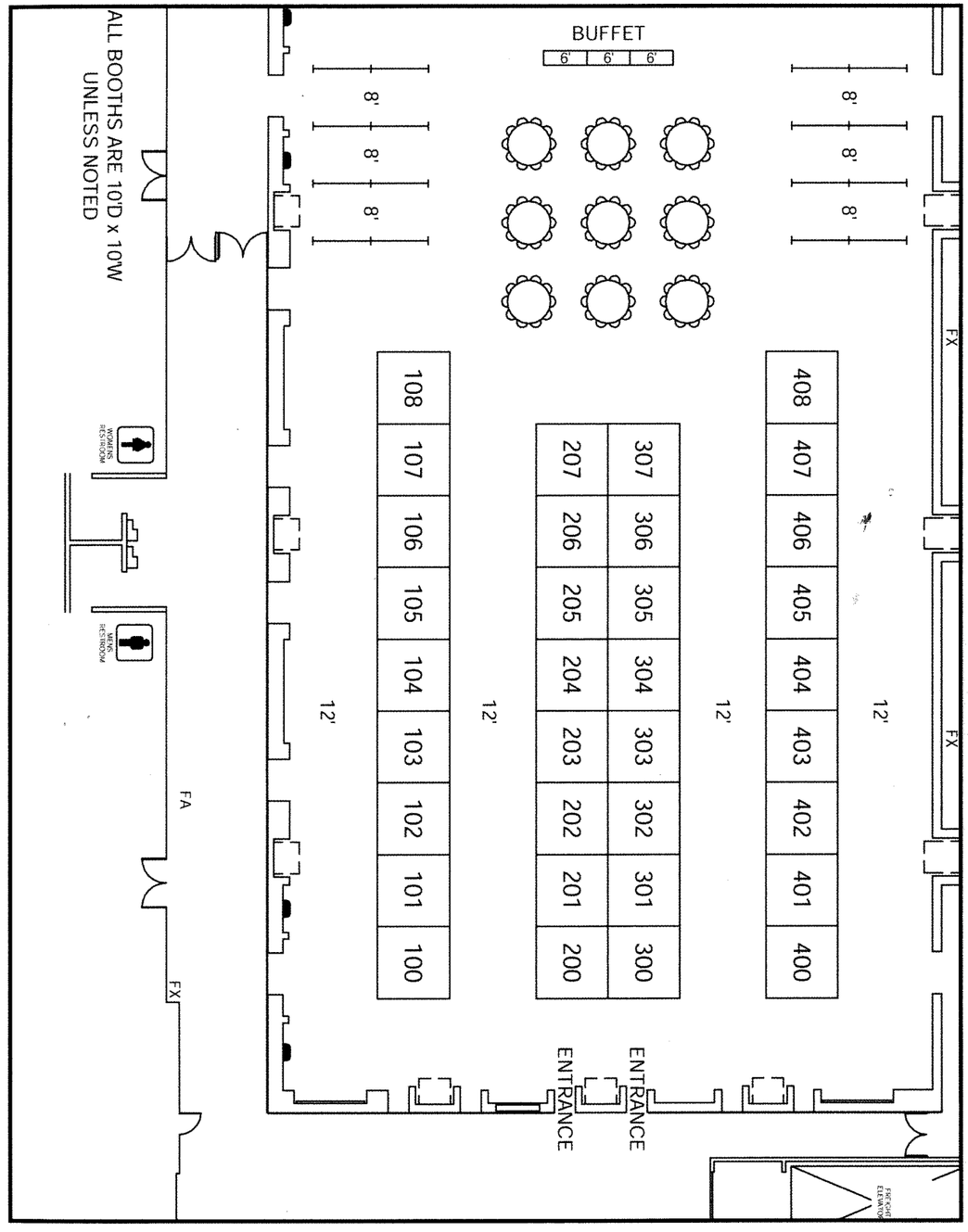
HOTEL FLOOR PLAN



Registration	Denver Ballroom Registration Desk
Speaker Ready Room	Denver Ballroom Registration Desk
Continental Breakfast	Denver Ballroom Foyer – Wednesday and Thursday Colorado Ballroom – Friday
General Session	Denver Ballroom
Exhibit Hall and Posters	Colorado Ballroom
Lunch with Exhibitors	Colorado Ballroom – Wednesday and Thursday

EXHIBIT FLOOR PLAN

EXHIBIT HALL—COLORADO BALLROOM



PROGRAM AT-A-GLANCE

	TIME	EVENT	LOCATION
TUESDAY NOVEMBER 28	7:00 AM – 7:00 PM	Registration	Denver Ballroom Registration Desk
	8:00 AM – 5:00 PM	Pre-Meeting Nurses Seminar	Colorado Ballroom GH
	9:00 AM – 4:00 PM	Pre-Meeting Cervical Spine Instrumentation Course	Off-site—University of Colorado HealthSciences Center - Fitzsimons Campus (Bus Departure 8:15)
	12:30 – 4:30 PM	Pre-Meeting Pediatric Coding Course	Nat Hill Room
	6:30 – 8:00 PM	Reception	Denver Ballroom
WEDNESDAY NOVEMBER 29	7:00 AM – 5:30 PM	Registration	Denver Ballroom Registration Desk
	7:00 – 8:00 AM	Continental Breakfast	Denver Ballroom Foyer
	7:50 AM – Noon	Scientific Sessions	Denver Ballroom
	9:00 AM – 5:30 PM	Exhibit and Poster Viewing	Colorado Ballroom
	10:00 – 10:30 AM	Beverage Break	Colorado Ballroom
	Noon – 1:00 PM	Lunch, Exhibits and Poster Viewing	Colorado Ballroom
	1:00 – 4:36 PM	Scientific Sessions	Denver Ballroom
	2:36 – 3:00 PM	Beverage Break	Colorado Ballroom
	4:36 – 5:30 PM	Wine and Cheese Reception (immediately following Scientific Sessions)	Colorado Ballroom
THURSDAY NOVEMBER 30	7:00 AM – 4:00 PM	Registration	Denver Ballroom Registration Desk
	7:00 – 8:00 AM	Continental Breakfast	Denver Ballroom Foyer
	8:00 – 10:15 AM	Scientific Sessions	Denver Ballroom
	9:00 AM – 4:00 PM	Exhibit and Poster Viewing	Colorado Ballroom
	10:15 – 10:45 AM	Beverage Break	Colorado Ballroom
	10:45 – 11:45 AM	Raimondi Lecture – Richard D. Lamm	Denver Ballroom
	11:45 AM – 12:45 PM	Lunch, Exhibits and Poster Viewing	Colorado Ballroom
	12:45 – 2:35 PM	Scientific Sessions	Denver Ballroom
	2:35 – 3:15 PM	Beverage Break	Colorado Ballroom
	4:50 – 5:20 PM	Special Lecture – Francois Lacour-Gayet, MD	Denver Ballroom
	5:20 – 5:50 PM	Annual Business Meeting	Denver Ballroom
FRIDAY DECEMBER 1	7:00 – 8:00 AM	Continental Breakfast	Colorado Ballroom
	7:00 – 10:00 AM	Registration	Denver Ballroom Registration Desk
	7:00 – 10:30 AM	Continental Breakfast, Exhibits and Poster Viewing	Colorado Ballroom
	8:00 – 9:30 AM	Special Symposium	Denver Ballroom
	9:30 AM – 1:00 PM	Scientific Sessions	Denver Ballroom
	10:06 – 10:30 AM	Beverage Break	Colorado Ballroom
	12:46 – 1:00 PM	Closing Remarks	Denver Ballroom

EXHIBITOR LISTING

The AANS/CNS Section on Pediatric Neurological Surgery gratefully recognizes the support of these exhibitors. (as of November 7, 2006)

Adam Williams Traumatic Brain Injury Initiative
P.O. Box 14417
Long Beach, CA 90853
United States
(562) 714-5151
www.missiontbi.com
Booth: 405

Aesculap Inc.
3773 Corporate Parkway
Center Valley, PA 18034
United States
(800) 258-1946
www.aesculap-usa.com
Booth: 306

ALOKA Ultrasound
10 Fairfield Blvd.
Wallingford, CT 06492
United States
(800) 872-5652
www.aloka.com
Booth: 305

American Association of Neurological Surgeons
5550 Meadowbrook Dr.
Rolling Meadows, IL 60008-3852
United States
(847) 378-0500
www.AANS.org
Booth: 404

BrainLAB, Inc.
3 Westbrook Corporate Center, Suite 400
Westchester, IL 60154
United States
(708) 409-1343
www.brainlab.com
Booth: 303

Codman, a Johnson & Johnson company
325 Paramount Drive
Raynham, MA 02767
United States
(508) 880-8100
www.codman.com
Booth: 300

Ellman Innovations
3333 Royal Avenue
Oceanside, NY 11572
United States
(516) 594-3333
www.ellman.com
Booth: 408

HCA Physician Recruitment
3 Maryland Farms, Ste. 250
Brentwood, TN 37027
United States
(615) 373-7571
www.practicewithus.com
Booth: 407

Hydrocephalus Association
870 Market St., Ste. 705
San Francisco, CA 94102
United States
(415) 732-7040
www.hydroassoc.org
Booth: 302

IMRIS
100-1370 Sony Place
Winnipeg, MB R3T 1N5
Canada
(204) 480-7070
www.imris.com
Booth: 401

Integra LifeSciences
311 Enterprise Drive
Plainsboro, NJ 08536-3344
United States
(609) 275-0500
www.integra-ls.com
Booth: 100

Journal of Neurosurgery
1224 Jefferson Park Ave., Ste. 450
Charlottesville, VA 22903
United States
(434) 924-5503
www.thejns-net.org
Booth: 103

Karl Storz Endoscopy-America, Inc.
600 Corporate Pointe Ave
Culver City, CA 90230-7600
United States
(310) 338-8100
www.karlstorz.com
Booth: 108

KLS - Martin , LP
P.O. Box 50249
Jacksonville, FL 32250-0249
United States
(904) 641-7746
www.klsmartin.com
Booth: 106

Leica Microsystems
90 Boroline Rd.
Allendale, NJ 07401
United States
(800) 526-0355
www.surgicalscopes.com
Booth: 101

Market Access Partners
3236 Meadowview Road
Evergreen, CO 80439
United States
(303) 526-1900
www.marketaccesspartners.com
Booth: 207

Medtronic, Inc.
710 Medtronic Parkway
Minneapolis, MN 55432-5604
United States
(763) 514-4000
www.medtronic.com
Booth: 200

OsteoMed L.P.
3885 Arapaho Road
Addison, TX 75001
United States
(972) 677-4600
www.osteomedcorp.com
Booth: 403

PhotoMedex, Inc.
147 Keystone Drive
Montgomeryville, PA 18936
United States
(215) 619-3600
www.photomedex.com
Booth: 105

Pro Med Instruments, Inc.
5450 Lee St. Suite 1
Lehigh Acres, FL 33971
United States
(239) 369-2310
www.headrest.de
Booth: 304

Sophysa USA Inc.
1620 Sunflower Avenue
Costa Mesa, CA 92626
United States
(714) 428-8801
www.sophysa.com
Booth: 402

Stryker Craniomaxillofacial
750 Trade Center Way Ste. 200
Portage, MI 49002-0482
United States
(800) 962-6558
www.stryker.com/cmf
Booth: 102

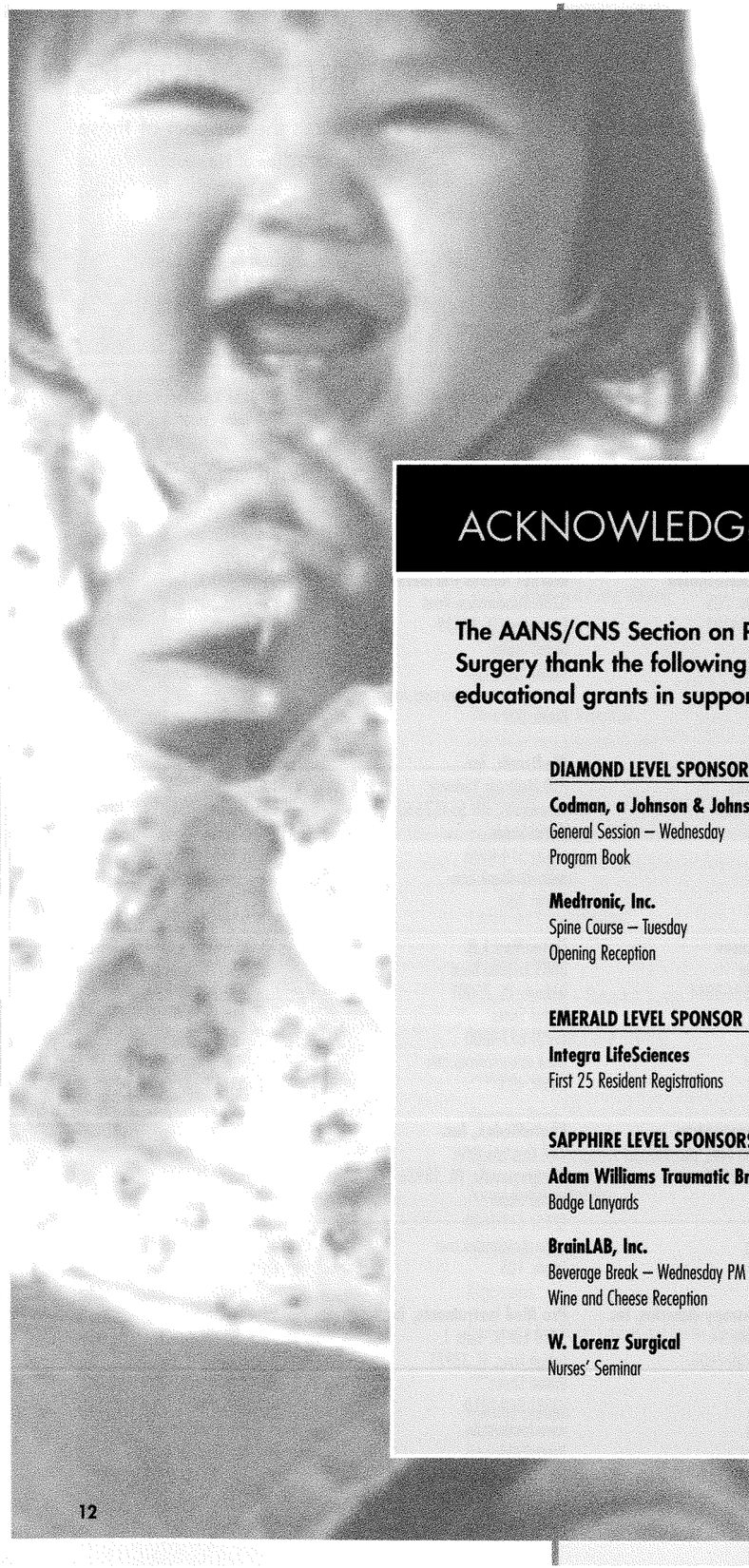
Synergetics, Inc.
3845 Corporate Centre Dr.
St. Louis, MO 63368
United States
www.synergeticsusa.com
(636) 939-5100
Booth: 400

Synthes CMF
1301 Groshen Parkway
West Chester, PA 19380
United States
(610) 719-6873
www.synthes.com
Booth: 104

The Children's Hospital–Denver
1056 E. 19th Avenue
Denver, CO 80218
United States
(303) 861-8888
www.thechildrenshospital.org
Booth: 107

Vygon Neuro
2495 General Armistead
Norristown, PA 19403
United States
(610) 539-9300
www.vygonusa.com
Booth: 406

W. Lorenz Surgical
1520 Tradeport Drive
Jacksonville, FL 32218
United States
(800) 874-7711
www.lorenzsurgical.com
Booth: 206



ACKNOWLEDGEMENTS

The AANS/CNS Section on Pediatric Neurological Surgery thank the following companies for their educational grants in support of the Annual Meeting:

DIAMOND LEVEL SPONSORS

Codman, a Johnson & Johnson company

General Session – Wednesday	$15,000
Program Book	$7,500

Medtronic, Inc.

Spine Course – Tuesday	$13,500
Opening Reception	$20,000

EMERALD LEVEL SPONSOR

Integra LifeSciences

First 25 Resident Registrations	$12,000

SAPPHIRE LEVEL SPONSORS

Adam Williams Traumatic Brain Injury Initiative

Badge Lanyards	$3,500

BrainLAB, Inc.

Beverage Break – Wednesday PM	$2,500
Wine and Cheese Reception	$3,500

W. Lorenz Surgical

Nurses' Seminar	$5,000

TUESDAY, NOVEMBER 28, 2006

7:00 AM – 7:00 PM
REGISTRATION
Denver Ballroom Registration Desk

8:00 AM – 5:00 PM
PRE-MEETING NURSES SEMINAR: TOPICS IN PEDIATRIC NEUROLOGICAL SURGERY
Colorado Ballroom GHI

Faculty: *Cathy Cartwright, RN, MSN; Alan Cohen, MD; Susan Ferson, MSN, CPNP; Nicholas Foreman, MD; Tania Shiminski-Maher, MS, CPNP; Patti Batchelder, MSN, CPNP; Patsy McGuire Cullen, MAEd, RN, CPNP; David Frim, MD, Margaret Skulj, RN; Vernon Chapman, MD*
Sponsor: W. Lorenz Surgical

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

- Discuss return to play guidelines for pediatric athletic concussions.
- Discuss techniques for dealing with difficult families and delivering bad news.
- Discuss the oncologic treatment of pediatric brain tumors.
- Compare and discuss treatment modalities for chronic spasticity.
- Describe the affects of melatonin on the sleep patterns of head injured patients.
- Describe and define concepts related to Functional Status and Quality of Life in children treated for CNS tumors.
- Compare and contrast the function of different shunt valves.

Nursing contact hours have been applied for.

8:15 AM
BUS DEPARTURE FOR UNIVERSITY OF COLORADO HEALTHSCIENCES CENTER – FITZSIMONS CAMPUS

9:00 AM – 4:00 PM
PRE-MEETING CERVICAL SPINE INSTRUMENTATION COURSE
This course is designed to introduce or enhance the surgeon's exposure to C1-2 transarticular screw fixation in children. Starting with didactic presentations, instructors will cover the history, anatomy, concepts and techniques relevant to performing this procedure.

A detailed presentation, followed by hands-on participation, will discuss the pre-operative planning and image manipulation necessary to safely perform C1-2 transarticular screw fixation. Pre-operative planning will be performed on both a high-speed CT work station and a Stealth station.

A hands-on cadaver session, with close interaction with the instructors, will conclude the session. The cadaver session will have full operative support consisting of flouroscopes and up-to-date instrumentation.

This course will take place off-site. Transportation will be provided.
Faculty: *Douglas L. Brockmeyer, MD; Richard C.E. Anderson, MD; Anthony M. Avellino, MD*

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

- Demonstrate familiarity with instrumentation available for C1-2 screw fixation.
- Evaluate and apply the latest surgical techniques for C1-2 screw fixation in children.

Sponsor: Medtronic, Inc.

12:30 – 4:30 PM
PRE-MEETING PEDIATRIC CODING COURSE
Advanced Coding Strategies for Pediatric Neurological Surgeons
Nat Hill

This is an advanced coding and reimbursement course targeted toward the practicing pediatric neurosurgeon and practice support staff who are interested in expanding their knowledge of pediatric neurosurgical coding.

This course will be case study or scenario driven and take attendees through an examination of complex pediatric case coding scenarios including a discussion surrounding the use of the endoscopic codes.

Prior to the course, registrants will have the opportunity to send in specific questions or operative scenarios which will be addressed on-site during the course. You may submit more than one question or scenario. All scenarios or questions should be forwarded via e-mail to nij@aans.org and include your contact information. Deadline for receipt is Tuesday, November 14. Attendees will need to bring CPT code books for use during the course. CPT books will be available for sale onsite, or you may pre-purchase your book from the coding and reimbursement categories on the AANS Marketplace Web site at http://marketplace.aans.org/

Faculty: *Gregory J. Przybylski, MD*

Learning Objective:
Upon completion of this course, participants should be able to:

- Review pediatric neurosurgical coding and apply to one's practice.

4:00 – 6:00 PM
SPEAKER READY ROOM
Denver Ballroom Registration Desk

6:30 – 8:00 PM
OPENING RECEPTION
Denver Ballroom
Come and enjoy a wonderful assortment of food and beverages as you visit with old friends and meet new colleagues at this year's Opening Reception. The event will be held at the Denver Marriott City Center. All registered attendees will receive ONE complimentary ticket to the Opening Reception. Additional tickets are available for $80 each.
Sponsor: Medtronic, Inc.

WEDNESDAY, NOVEMBER 29, 2006

7:00 AM – 5:30 PM
REGISTRATION
Denver Ballroom Registration Desk

7:00 AM – 4:00 PM
SPEAKER READY ROOM
Denver Ballroom Registration Desk

7:00 – 8:00 AM
CONTINENTAL BREAKFAST
Denver Ballroom Foyer

7:50 – 7:55 AM
WELCOME AND OPENING REMARKS
Denver Ballroom
Rick Abbott, MD

7:55 – 8:00 AM
MEETING OVERVIEW
Michael H. Handler, MD, FACS, FAAP

8:00 – 8:48 AM
SCIENTIFIC SESSION I: CRANIOSYNOSTOSIS
Denver Ballroom
Moderators: *John Ragheb, MD; David W. Pincus, MD, PhD*
Sponsor: Codman, a Johnson & Johnson company

8:00 – 8:12 AM
1. **Cavarial Growth Following Surgical Treatment of Craniosynostosis**
Alex Khalessi, MD; Mark D. Krieger, MD; Ira Bowen; J. Gordon McComb, MD (Los Angeles, CA)

8:12 – 8:24 AM
2. **Problems in Craniosynostosis: Elevated ICP as Measured by LP as an Adjunct to Management**
Malini V. Narayanan, MD, MS; David Frim, MD, PhD; Bakhtiar Yamin; MD; Daniel Curry, MD (Chicago, IL)

8:24 – 8:36 AM
3. **Long-term Outcome of Infants with Positional Occipital Plagiocephaly**
Paul Steinbok, MBBS, BSc, BC; Swati Singh, MD; Patricia Mortenson, MSc; Ashutosh Singhal, MD, FRCSC (Vancouver, British Columbia, Canada)

8:36 – 8:48 AM
4. **Correction of Frontal Bossing After Spring Mediated Cranioplasty for Sagittal Synostosis**
Alexander K. Powers, MD; Heather L. Green, BA; Lisa David, MD; Steven Glazier, MD, FACS (Winston-Salem, NC)

8:48 – 10:00 AM
SCIENTIFIC SESSION II: CONGENITAL ANOMALIES
Denver Ballroom
Moderators: *Timothy M. George, MD; Neil Feldstein, MD, FACS*

8:48 – 9:00 AM
5. The Normal Level of Termination of the Conus Medullaris in Children
Mark S. Dias, MD; Henry Kestler, MD; Paul Kalapos, MD (Hershey, PA)

9:00 – 9:12 AM
6. Cardiological Evaluation of Chiari 1-Related Drop Attacks
David Frim, MD, PhD; Kimberly Foster, BA; Frank Zimmerman, MD (Chicago, IL)

9:12 – 9:24 AM
7. Symptomatology of Chiari Malformation Type 1 in Patients Under Age 5
Malini Narayanan, MD, MS; David Frim, MD, PhD (Chicago, IL)

9:24 – 9:36 AM
8. Autologous Duraplasty in Chiari Type I Malformation
Caitlin E. Hoffman, BA; Isamah T. Nneka; Mark M. Souweidane, MD (New York, NY)

9:36 – 9:48 AM
9. Intraoperative Neurophysiological Monitoring in Patients Undergoing Tethered Cord Surgery after Fetal Myelomeningocele Repair
Eric M. Jackson, MD; Daniel M. Schwartz, PhD; N. Scott Adzick, MD; Mark P. Johnson, MD; Leslie N. Sutton, MD (Philadelphia, PA)

9:48 – 10:00 AM
10. The Chiari I Malformation in the Very Young Pediatric Population
Arnold H. Menezes, MD; Kathleen A. Donovan, ARNP, MSN (Iowa City, IA)

9:00 AM – 5:30 PM
EXHIBIT & POSTER VIEWING IN EXHIBIT HALL
Colorado Ballroom

10:00 – 10:30 AM
BEVERAGE BREAK IN EXHIBIT HALL
Colorado Ballroom

10:30 AM – 12:06 PM
SCIENTIFIC SESSION III: GENERAL INTEREST
Denver Ballroom
Moderators: *Nalin Gupta, MD, PhD; Michael Partington MD, FACS*

10:30 – 10:42 AM
11. Operative Complications, Fusion Rate and Neurologic Outcome After Surgical Stabilization of Thoracolumbar Fractures in Children
James M. Johnston, MD; Neill Wright, MD; Matthew Smyth, MD; Tae Sung Park, MD; Jeff Leonard, MD (St. Louis, MO)

10:42 – 10:54 AM
12. Surgical Management of Atlanto-axial Instability in Children
John Thorne, MD; Likhith Alakandy, FRCS; Richard Cowie, FRCS (Manchester, United Kingdom)

10:54 – 11:06 AM
13. Selection of Rigid Internal Fixation Construct for Stabilization at the Craniovertebral Junction in Pediatric Patients
Richard C. E. Anderson, MD (New York, NY); Brian T. Ragel, MD (Salt Lake City, UT); J. Mocco, MD (New York, NY); Leif-Erik Bohman, BA (New York, NY); Douglas L. Brockmeyer, MD (Salt Lake City, UT)

11:06 – 11:18 AM
71. Transitioning the Spina Bifida Patient to an Adult Medical Home: The Jacksonville Experience
Hector E. James, MD; David L. Wood, MD (Jacksonville, FL)

11:18 – 11:30 AM
15. Screw Fixation of the Upper Cervical Spine in The Pediatric Population
David J. Sacco, MD; Bradley Weprin, MD; Frederick Sklar, MD; Dale Swift, MD; Angela Price, MD (Dallas, TX)

11:30 – 11:42 AM
16. Spinal Stenosis in Pediatric Achondroplasia
Daniel M. Sciubba, MD; Neena I. Marupudi, MS; Marcus J. Bookland, MD; Carlos A. Bagley, MD; Joseph C. Noggle; Michael C. Ain, MD; Benjamin S. Carson, MD; George I. Jallo, MD (Baltimore, MD)

11:42 – 11:54 AM
17. Our Recent Experience with Primary Cranial Vault Encephaloceles: 44 Cases
Cuong Bui, MD; Richard S. Tubbs, PhD, PA-C; Elise P. Salerno, MS; Blake Pearson, MD; Leslie J. Acakpo-Satchivi, MD, PhD, (Birmingham, AL); John C. Wellons, III, MD; Jefferey B. Blount, MD; Walter J. Oakes, MD (Birmingham, AL)

11:54 AM – 12:06 PM
18. Evaluation of MRI-based Measurement of ICP in Pediatric Patients: Early Results
Noam Alperin, PhD; Joy Ito, RN; Tadanori Tomita, MD; John Curran, MD; Roberta Glick, MD (Chicago, IL)

12:00 – 1:00 PM
LUNCH AND POSTER VIEWING IN THE EXHIBIT HALL
Colorado Ballroom

1:00 – 2:36 PM
SCIENTIFIC SESSION IV: EPILEPSY/FUNCTIONAL
Denver Ballroom
Moderators: *Frederick A. Boop, MD, FACS; Joseph R. Madsen, MD*

1:00 – 1:12 PM
19. The Application of Electromagnetic Image Guidance Technology in Paediatric Neurosurgery
Caroline S. Hayhurst, MD; Neil Buxton, MD; Paul L. May, MD; Conor L. Mallucci, MD (Liverpool, United Kingdom)

1:12 – 1:24 PM
20. Pallidal Deep Brain Stimulation for Dystonia in Pediatric Patients
Ron L. Alterman, MD; Joan Miravite, FNP (New York, NY); Jay Shils, PhD (Boston, MA); Donald Weisz, PhD; Michele Tagliati, MD, DDS (New York, NY)

1:24 – 1:36 PM
21. Surgical Treatment of Spasticity in Children: Comparison of Selective Dorsal Rhizotomy and Intrathecal Baclofen Pump Implantation
Peter Kan, MD; John Kestle, MD; Marion Walker, MD; Judith Gooch, MD (Salt Lake City, UT)

1:36 – 1:48 PM
22. CT/MRI Fusion for Neuronavigation in Subdural Grid Based Epilepsy Surgery: Technical Note
James M. Johnston, MD; Matthew Smyth, MD (St. Louis, MO)

1:48 – 2:00 PM
23. Epilepsy Surgery Outcome in 83 Pediatric Patients - The Children's Hospital of Wisconsin Experience
Sean M. Lew, MD; Mary L. Zupanc, MD; Rhonda Roell–Werner, RN; Michael J. Schwabe, MD; Wade Mueller, MD (Milwaukee, WI)

2:00 – 2:12 PM
24. Management of Vagal Nerve Stimulator Infections- Do They Need to be Removed?
Rachana Tyagi, MD; Yashar M. Ghomri, BS; Andrew W. Grande, MD; Bradford Curt, MD; Kerry R. Crone, MD; Francesco T. Mangano, DO (Cincinnati, OH)

2:12 – 2:24 PM
25. Electrophysiological Analysis Comparing Epileptogenic Human Cortex and Hyperexcited Rat Cortex
Jodi L. Smith, PhD, MD (Indianapolis, IN); Jonathan P. Hobbs, BS (Bloomington, IN); Hema Patel, MD (Indianapolis, IN); John M. Beggs, PhD (Bloomington, IN)

2:24 – 2:36 PM
26. Early Obstacles to Complex Intraventricular Robotic Surgery: Neurosurgical Considerations for the DaVinci Surgical Robot
Chris S. Karas, MD (Columbus, OH)

2:36 – 3:00 PM
BEVERAGE BREAK IN EXHIBIT HALL
Colorado Ballroom
Sponsor: BrainLAB, Inc.

3:00 – 4:36 PM
SCIENTIFIC SESSION V: HYDROCEPHALUS I
Denver Ballroom
Moderators: *Paul Grabb, MD; Rick Abbott, MD*

3:00 – 3:12 PM
27. Predictors of Shunt Survival After Revision
Sherise Ferguson, MD; Griffin Meyers, BA; David Rosen, MD; David Frim, MD, PhD (Chicago, IL)

3:12 – 3:24 PM
28. Hydrocephalus, Cognition and Acute Changes in Intracranial Pressure
Ben Pykkonnen; Scott Hunter, PhD; Eric Larsen, PhD; Maureen Lacy, PhD; Dawn Mottlow, RN, MSN; David Frim, MD, PhD (Chicago, IL)

3:24 – 3:36 PM
29. 6 Years Experience with Gravitational Valves for Pediatric Hydrocephalus Patients
Martina Messing-Juenger, MD; Luisa Wilms; Sergey Persits, MD; Hans-Jakob Steiger, MD (Dusseldorf, Germany)

3:36 – 3:48 PM
30. Clinical Performance of a Gravity Assisted Valve in a Pediatric Population
Hannes Haberl, PhD, MD; Paedi-Gav Study Group; Petra V. Berenberg, MD (Berlin, Germany)

3:48 – 4:00 PM
31. Long Term Success Following Shunt Revision by the Percutaneous Endoscopic Recanalization of Catheter (PERC) Technique
Jogi V. Pattisapu, MD; Christopher A. Gegg, MD; Gregory Olavarria, MD (Orlando, FL)

4:00 – 4:12 PM
32. Predictors of Quality of Life in Children with Hydrocephalus
Abhaya V. Kulkarni, MD, PhD; Iffat Shams, MD, MPH (Toronto, Ontario, Canada)

4:12 – 4:24 PM
33. Interobserver Agreement in Assessing Shunt Failure
Hugh J.L. Garton, MD; Sandhya Krishnan; Karin M. Muraszko, MD (Ann Arbor, MI)

4:24 – 4:36 PM
34. Poor Flow on Ventricular Shunt Tap is Highly Predictive of Proximal Catheter Shunt Malfunction
Brandon Rocque, MD; Samir Lapsiwala, MD; Bermans J. Iskandar, MD (Madison, WI)

4:36 – 5:30 PM
WINE & CHEESE RECEPTION IN EXHIBIT HALL
Colorado Ballroom
Plan to attend the Wine and Cheese Reception in the Exhibit Hall. During the reception, you will have the opportunity to view the latest advances in technology and view the scientific poster presentations that have been selected for display at the 35th Annual Meeting of the AANS/CNS Section on Pediatric Neurological Surgery.
Sponsor: BrainLAB, Inc.

5:30 – 6:30 PM
HOW TO WRITE QUESTIONS FOR SANS
Room TBD
Corey Raffel, MD, PhD and Nathan R. Selden, MD, PhD

THURSDAY, NOVEMBER 30, 2006

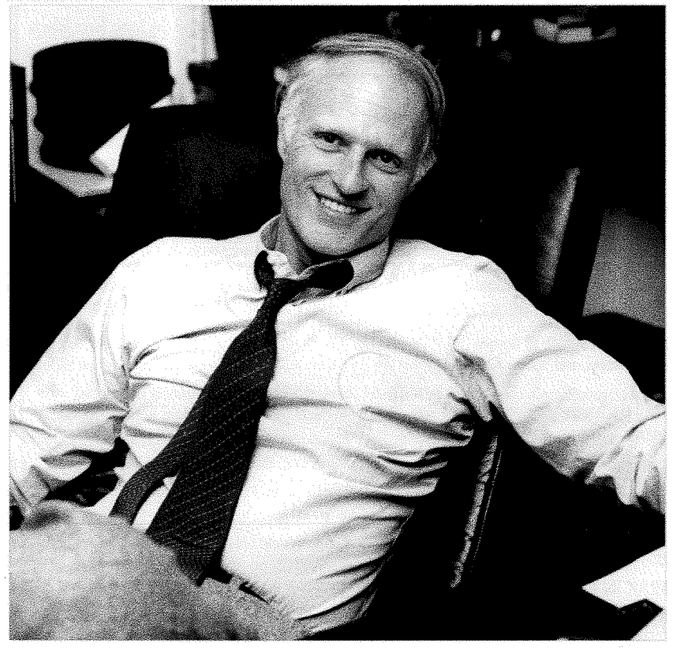
7:00 AM – 4:00 PM
REGISTRATION
Denver Ballroom Registration Desk

7:00 AM – 4:00 PM
SPEAKER READY ROOM
Denver Ballroom Registration Desk

7:00 – 8:00 AM
CONTINENTAL BREAKFAST
Denver Ballroom Foyer

8:00 – 10:12 AM
SCIENTIFIC SESSION V: HYDROCEPHALUS II
Denver Ballroom
Moderators: *Michael R. Egnor, MD Alan R. Cohen, MD, FACS, FAAP*

8:00 – 8:12 AM
REMEMBERING FRED J. EPSTEIN, MD 1937-2006
Delivered by Rick Abbott, MD



8:12 – 8:24 AM
35. Effects of Different CSF Obstruction Sites in Experimental Communicating Hydrocephalus
James P. McAllister, PhD; Jie Li, MD, MBA; Joel Parraghi; Janet M. Miller, PhD; Yimin Shen, PhD (Detroit, MI); Michael R. Egnor, MD; Mark E. Wagshul, PhD (Stony Brook, NY); E. Mark Haacke, PhD (Detroit, MI); Curt Stewart, MP, MS (Carefree, AZ); Marion E. Walker, MD (Salt Lake City, UT); Steven D. Ham, DO (Detroit, MI)

8:24 – 8:36 AM
36. Priorities for Hydrocephalus Research: Report from the NIH-sponsored Workshop "Hydrocephalus: Myths, New Facts, Future Directions"
James P. McAllister, PhD (Detroit, MI); Michael A. Williams, MD (Baltimore, MD); Marion L. Walker, MD (Salt Lake City, UT); Dory Kranz, BS (San Francisco, CA); Lolli Fleming, BS (West Roxbury, MA); Marvin Bergsneider, MD (Los Angeles, CA); Marc R. Del Bigio, MD, PhD (Winnepeg, MB, Canada); David M. Frim, MD (Chicago, IL); John R.W. Kestle, MD (Salt Lake City, UT); Mark G. Luciano, MD, PhD (Cleveland, OH); Joseph R. Madsen, MD (Boston, MA)

8:36 – 8:48 AM
38. The Belfast Experience Using Optic Nerve Sheath Ultrasound in the Assessment of Pediatric Hydrocephalus
David McAuley, FRCS; Anne Paterson; Louise Sweeney (Belfast, United Kingdom)

8:48 – 9:00 AM
39. Outcome Analysis of Shunt Valve Pressure Relative to Shunt Malfunction in Children
Holly Gilmer-Hill, MD; Mohammad S. Shukairy, MD; Chaim Colen, MD, PhD; Tiffany Sakleh, PA-C; James P. McAllister, PhD; Sandeep Sood, MD; Steven Ham, MD (Detroit, MI)

9:00 – 9:12 AM
40. Percuntaneous Gastrotomy and Nissen Fundoplication Related Infections of Pediatric Cerebral Fluid Shunts
Cuong Bui, MD; Richard S. Tubbs, PhD, PA-C; Gigi Raymon, CRNP; Traci Morgan, RN; Elise P. Salerno, MS; Douglas Barnhart, MD; Leslie J. Acakpo-Satchivi, MD, PhD; John C. Wellons, III, MD; Walter J. Oakes, MD; Jefferey P. Blount, MD (Birmingham, AL)

9:12 – 9:24 AM
41. Cerebral Mantle Reconstitution after Shunting Infants at Children's Hospital of Eastern Ontario with Severe Hydrocephalus
Benedicto C. Baronia, MD; Vassilyadi Ventureyra; Abdulghader Alfasi, MD (Ottawa, Ontario, Canada)

9:24 – 9:36 AM
42. Antibiotic Impregnated Shunt (AIS) Components are Safe and Efficacious in the Treatment of Infantile Hydrocephalus
Daniel M. Sciubba, MD; Joseph C. Noggle; Neena I. Marupudi, MS; George I. Jallo, MD (Baltimore, MD)

9:36 – 9:48 AM
43. Internal Cranial Expansion for the Treatment of Slit Ventricle Syndrome: A Technical Note
Todd C. Hankinson, MD; J. D. Mocco, MD; Brent Kimball, BS; Richard C. E. Anderson, MD; Neil A. Feldstein, MD (New York, NY)

9:48 – 10:00 AM
44. Virtual Reality Neurendoscopy
Jeffrey E. Catrambone, MD; Reza Karmini, MD; Michael Schulder, MD; Peter W. Carmel, MD, DMSc (Newark, NJ)

10:00 – 10:12 AM
45. Demographics and Treatment of Severe Headaches in Children and Young Adults with Shunts
Harold L. Rekate, MD (Phoenix, AZ); Nalin Gupta, MD; Dory Kranz (San Francisco, CA)

9:00 AM – 4:00 PM
EXHIBIT & POSTER VIEWING IN EXHIBIT HALL
Colorado Ballroom

10:15 – 10:45 AM
BEVERAGE BREAK IN EXHIBIT HALL
Colorado Ballroom

10:45 – 10:50 AM
INTRODUCTION OF THE RAIMONDI LECTURER
Denver Ballroom
Michael H. Handler, MD, FACS, FAAP

10:50 – 11:45 AM
RAIMONDI LECTURE
"A NEW MORAL VISION FOR HEALTH CARE"
Richard D. Lamm

11:45 AM – 12:45 PM
LUNCH AND POSTER VIEWING IN THE EXHIBIT HALL
Colorado Ballroom

12:45 – 2:35 PM
SCIENTIFIC SESSION VII: TUMOR I
Denver Ballroom
Moderators: *Mark M. Souweidane, MD; Liliana C. Goumnerova, MD, FACS(C)*

12:45 – 12:57 PM
46. Familial Intracranial Dermoids: Etiopathogenesis and Management Strategies
Sunil Manjila, MD; Mark Cohen, MD; Georgia Wiesner, MD; Alan R. Cohen, MD (Cleveland, OH)

12:57 – 1:09 PM
47. Patterns of Treatment and Tumor Progression in Pediatric Optic Pathway Gliomas
Rashida Campwala, BA; Mark D. Krieger, MD; Ira Bowen, BA; J. Gordon McComb, MD (Los Angeles, CA)

1:09 – 1:21 PM
48. Radical Resection of Pediatric Craniopharyngiomas and the Long Term Effects on Quality of Life
Kevin E. Hsieh, MD; Jeffrey Wisoff, MD (New York, NY)

1:21 – 1:33 PM
49. Optic Pathway Glioma; A New Surgical Observation
Jessica Clevenger; Marike Zwieneberg-Lee, MD; Frederick A. Boop, MD; Robert A. Sanford, MD (Memphis, TN)

1:33 – 1:45 PM
50. Treatment of Recurrent Ependymoma
Marike Zwienenberg-Lee, MD; Frederick A. Boop, MD; Thomas E. Merchant, DO; Robert A. Sanford, MD (Memphis, TN)

1:45 – 1:57 PM
51. Long-term Survival in Patients Diagnosed with Atypical Teratoid/Rhabdoid Tumors
Manuel Ferreira, MD, PhD; David Ebb, MD; William E. Butler, MD (Boston, MA)

1:57 – 2:09 PM
52. The Role of Neurosurgical Management in Children with Langerhans Cell Histiocytosis
Laurence Davidson, MD; J. Gordon McComb, MD; Ira Bowen, BA; Mark D. Krieger, MD (Los Angeles, CA)

2:09 – 2:21 PM
53. Radiation-induced Injury Following Gamma Knife Stereotactic Radiosurgery in Pediatric Patients with Intracranial Tumors and Arteriovenous Malformations
Lewis C. Hou, MD; Amy L. Sun; Tiffany Prugpichailers; Victor K. Tse, MD, PhD; Michael SB Edwards, MD (Stanford, CA)

2:21 – 2:35 PM
54. Brainstem Lesions in Neurofibromatosis 1
Nicole J. Ullrich, MD, PhD; Ali Raja, MD; Mark W. Kieran, MD, PhD; Karen J. Marcus, MD; Liliana Goumnerova, MD (Boston, MA)

2:35 – 3:15 PM
BEVERAGE BREAK IN EXHIBIT HALL
Colorado Ballroom

3:15 – 4:50 PM
SCIENTIFIC SESSION VIII: TUMOR II
Denver Ballroom
Moderators: *Jeffrey H. Wisoff, MD; George I. Jallo, MD*

3:15 – 3:27 PM
55. Abnormal Diffusion Characteristics in Pediatric Supratentorial Brain Tumor, a DTI Study
Andrew W. Grande, MD; Weihong Yuan, PhD; Scott K. Holland, PhD; Blaise V. Jones, MD; Kerry R. Crone, MD; Francesco T. Mangano, DO (Cincinnati, OH)

3:27 – 3:39 PM
56. Gene Expression Profiling of Malignant Rhabdoid Tumors and the Implications
Manuel Ferreira, MD, PhD; Scott L. Pomeroy, MD, PhD (Boston, MA)

3:39 – 3:51 PM
57. Micro Array Profiling of Childhood Ependymoma Identifies a Distinct Gene Subset Related to AKT2 Over Expression
Timothy E. Van Meter, PhD; Gary W. Tye, MD; Morgan McCrocklin; John D. Ward, MD; Catherine I. Dumur, PhD; William C. Broaddus, MD, PhD (Richmond, VA)

3:51 – 4:03 PM
58. Greatly Impaired Migration of Aquaporin-4 Deficient Astroglial Cells After Implantation into Mouse Brain
Kurtis I. Auguste, MD; Geoffrey Manley, MD, PhD; Victor Perry, MD; Peter Sun, MD; Nalin Gupta, MD; Alan S. Verkman, MD, PhD (San Francisco, CA)

4:03 – 4:15 PM
59. Spontaneous Hemorrhage in Pediatric Brain Tumors
Mony Benifla, MD; Suzzane Laughlin, MD; Ute Bartels, MD; Maria Lamberti-Pasculli, RN; James T. Rutka, MD, PhD; Peter B. Dirks, MD, PhD (Toronto, Ontario, Canada)

4:15 – 4:27 PM
60. Identification of Inhibitors of Pediatric Brain Tumor Stem Cells
Ichiro Nakano, MD, MSc; Michael Masterman-Smith; Jorge A. Lazareff, MD; Steve Horvath, MD; Linda Liau, MD, PhD; James Washek, MD; Daniel H. Geschwind, MD, PhD; Stanley Nelson, MD, PhD; Paul Mischel, MD; Harley I. Kornblum, MD PhD (Los Angeles, CA)

4:27 – 4:39 PM
61. Primary Vertebral Neoplasms in the Pediatric Patient
Albert J. Fenoy, MD; Arnold H. Menezes, MD; Jeremy D.W. Greenlee, MD; Kathleen A. Donovan, ARNP, MSN; Yutaka Sato, MD (Iowa City, IA)

4:39 – 4:51 PM
62. Aquaporin-1 Membrane Channel Protein Level is Decreased in Developing H-Tx Rat Brains
Mohammad Nabiuni, PhD; Swinburne A. Augustine, PhD; Leena Paul, MA; Mohamed Gharnit; Jogi V. Pattisapu, MD (Orlando, FL)

4:50 – 5:20 PM
SPECIAL LECTURE
Denver Ballroom
"ASSESSMENT OF SURGICAL OUTCOMES MUST ACCOUNT FOR COMPLEXITY"
Francois Lacour-Gayet, MD
Chief of Cardiac Surgery, The Children's Hospital, Denver

5:20 – 5:50 PM
ANNUAL BUSINESS MEETING
Denver Ballroom

6:00 PM – 7:00 PM
"CONGENITAL NEUROSURGEONS: TRANSITIONING CHILDREN WITH HYDROCEPHALUS INTO THE ADULT MEDICAL WORLD"
Room TBD
Harold L. Rekate, MD
Finding colleagues and committed pediatric specialists who are interested in the unique problems of young adults that have graduated from care in children's hospitals is one of the major challenges that is facing systems that deliver health care. For example, more adults than children are being operated upon for problems related to congenital heart disease. The American Academy of Pediatrics has identified this problem as a major concern. Please join us to explore how those of us who remain interested in the care of grownups with pediatric neurosurgical problems can network and determine whether there is any interest in defining a group of "congenital neurosurgeons."

FRIDAY, DECMEBER 1, 2006

7:00 – 8:00 AM
CONTINENTAL BREAKFAST IN EXHIBIT HALL
Colorado Ballroom

7:00 – 12:00 PM
SPEAKER READY ROOM
Denver Ballroom Registration Desk

7:00 – 10:00 AM
REGISTRATION
Denver Ballroom Registration Desk

7:00 – 10:30 AM
EXHIBIT & POSTER VIEWING IN EXHIBIT HALL
Colorado Ballroom

8:00 – 9:30 AM
SPECIAL SYMPOSIUM
Denver Ballroom
"CURRENT ISSUES IN NON-ACCIDENTAL TRAUMA"
Introduced by: *Michael H. Handler, MD, FACS, FAAP*
Speakers: *Ann-Christine Duhaime, MD, Program Director, Pediatric Neurosurgery, Dartmouth-Hitchcock Medical Center*
Richard D. Krugman, MD, Dean, University of Colorado School of Medicine, Andrew P. Sirotnak, MD, Director, Kempe Child Protection Team, The Children's Hospital, Denver

9:30 – 10:06 AM
SCIENTIFIC SESSION IX: TRAUMA
Denver Ballroom
Moderators: *Douglas L. Brockmeyer, MD; Mark S. Dias, MD*

9:30 – 9:42 AM
63. Subdural Hematoma in the Setting of Subarachnomegaly
Daniel J. Curry, MD; Malini Narayanan, MD, PhD; Bakhtiar Yamini, MD; David Frim, MD, PhD; Kelly Staley, MD; Jill Glick, MD (Chicago, IL)

9:42 – 9:54 AM
64. Folate Receptor Function is Essential in CNS Recovery after Injury: Evidence in Knockout Mice
Elias B. Rizk, MD (Harrisburg, PA); Bermans J. Iskandar, MD (Madison, WI)

9:54 – 10:06 AM
65. Repeat CT Imaging in Pediatric Traumatic Brain Injury: When Does it Make a Difference?
Susan R. Durham, MD (Lebanon, NH); Kenneth Liu, MD; Nathan Selden, MD, PhD (Portland, OR)

10:06 – 10:30 AM
BEVERAGE BREAK IN EXHIBIT HALL
Colorado Ballroom

10:30 AM – 12:46 PM
SCIENTIFIC SESSION X: GENERAL INTEREST
Denver Ballroom
Moderators: *TBD; Joseph H. Piatt, Jr., MD*

10:30 – 10:42 AM
66. The Open Terminal Myelocystocele: An "Exposed" Neural Tube Defect of Secondary Neurulation
Michael J. Burke, MD, FACS (Corpus Christi, TX)

10:42 – 10:54 AM
67. Dynamic Cervicomedullary Cord Compression and Alterations in Cerebrospinal Fluid Dynamics in Children with Achondroplasia
Moise Danielpour, MD; Bill Wilcox, MD; Yasmin Alanay, MD; David Rimoin, MD, Prof (Los Angeles, CA)

10:54 – 11:06 AM
68. Modified Osteoplastic Orbitozygomatic Craniotomy in the Pediatric Population
Matthew L. Miller, MD; Sean M. Lew, MD; Cheryl A. Muszynski, MD; Bruce A. Kaufman, MD (Milwaukee, WI)

11:06 – 11:18 AM
69. Analysis of Subdural Empyema: A Retrospective Study
Jeffrey E. Catrambone, MD; Serena Fernandes, BA; Charles Prestigiacomo, MD; Peter W. Carmel, MD, DMSc (Newark, NJ)

11:18 – 11:30 AM
70. Central Nervous System Blastomycosis in Children- The University of Manitoba Experience
Michael J. Ellis, BSC; Patrick J. McDonald, MD, FRCSC (Winnipeg, MB, Canada)

11:30 – 11:42 AM
14. Occipitocervical Instrumentation in the Pediatric Population using the ABT Loop System: Initial Results and Long-term Follow-up
Daniel E. Couture (Salt Lake City, UT); Nathan Avery, MD (Flagstaff, AZ); Douglas L. Brockmeyer, MD (Salt Lake City, UT)

11:42 – 11:54 AM
72. Increased Risk of Wound Infection with the Use of BioGlue
Paul Klimo, MD, MPH; Amer Khalil, MD; Liliana C. Goumnerova, MD (Boston, MA)

11:54 AM – 12:06 PM
73. Choice of Surgical Revascularization in Childhood Moyamoya Angiopathy
Nadia Khan, MD; Yasuhiro Yonekawa, MD (Zurich, Switzerland)

12:06 – 12:18 PM
74. Moyamoya Associated with Sickle Cell Disease: Outcome Following Surgical Revascularization
Edward R. Smith, MD; Craig D. McClain, MD; R. Michael Scott, MD (Boston, MA)

12:18 – 12:30 PM
75. Chorea in Association with Moyamoya Syndrome: Results of Surgical Revascularization and a Proposed Clinicopathological Correlation
Edward S. Ahn, MD; Andrew E. Chapman; Edward R. Smith, MD; R. Michael Scott, MD (Boston, MA)

12:30 – 12:42 PM
76. The Spectrum of Cerebrovascular Anomalies Encountered in PHACES Syndrome
Kurtis I. Auguste, MD; Brandon Davis, BA (San Francisco, CA); Denise Metry, MD (Houston, TX); Heather J. Fullerton, MD; Victor L. Perry, MD; Peter P. Sun, MD; Christopher Dowd, MD; Anthony Barkovich, MD; Ilona Frieden, MD (San Francisco, CA); Nalin Gupta, MD, PhD (San Francisco, CA)

12:46 – 1:00 PM
CLOSING REMARKS
Michael H. Handler, MD, FACS, FAAP

CME SELF-REPORT WORKSHEET

IMPORTANT INSTRUCTIONS FOR SELF-REPORTING CME FOR THE 2006 AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY ANNUAL MEETING:

1. **You must login to MyAANS.org to self-report your CME.** Be sure to have your username (email address) and password. Once logged in, click on "Self-Reporting" on the left and choose *AANS/CNS Section on Pediatric Neurological Surgery*.
2. Do not self-report CME credit for the Tuesday optional events. By turning in your ticket onsite for these optional events, credit will automatically be added to your record by Monday, December 15, 2006, after which time you can print your CME certificate. **If you did not attend any optional events**, you may print out your CME certificate from any computer attached to a printer after the conclusion of the meeting.
3. MyAANS.org can be accessed from any computer with Internet service during and after the meeting.
4. Credit can only be claimed in increments of .25 hours.
5. You **must click on the blue SUBMIT button** each time you go in to self-report on MyAANS.org or the information entered will not be submitted.
6. This worksheet is for your records only. It is designed to help you keep track of the amount of time you spend in each session.

Please be sure to login to MyAANS.org to self-report your CME for the 2006 AANS/CNS Section on Pediatric Neurological Surgery Annual Meeting* ***before February 1, 2007*.*

DAY/DATE	PRESENTATION	POSSIBLE CREDITS FOR DAY	CREDITS TO CLAIM ON MYAANS.ORG
Wednesday, November 29, 2006			
8:00 – 10:00 AM	Scientific Session I & II	2	
10:30 AM – NOON	Scientific Session III	1.5	
1:00 – 2:45 PM	Scientific Session IV	1.75	
3:00 – 4:45 PM	Scientific Session V	1.75	
5:30 – 6:30 PM	How to Write SANS Questions	1	
Total maximum credits for day (Cannot exceed 8 credit hours for the day):			
Thursday, November 30, 2006			
8:15 – 10:15 AM	Scientific Session VI	2	
10:45 – 11:45 AM	Raimondi Lecture	1	
12:45 – 2:35 PM	Scientific Session VII	1.75	
3:15 – 4:50 PM	Scientific Session VIII	1.5	
4:50 – 5:20 PM	Special Lecture	0.5	
6:00 – 7:00 PM	Cogenital Neurosurgeons	1	
Total maximum credits for day (Cannot exceed 7.75 credit hours for the day):			
Friday, December 1, 2006			
8:00 – 9:30 AM	Special Symposium	1.5	
9:30 – 9:55 AM	Scientific Session IX	0.5	
10:30 AM – 12:45 PM	Scientific Session X	2.25	
Total maximum credits for day (Cannot exceed 4.25 credit hours for the day):			
TOTAL MAXIMUM CREDITS FOR MEETING (Excluding Optional Events)		**20**	

Worksheet! Please Do Not Fax.
This form must be submitted via MyAANS.org

SPEAKER DISCLOSURE INFORMATION

The AANS controls the content and production of this CME activity and attempts to ensure the presentation of balanced, objective information. In accordance with the Standards for Commercial Support established by the Accreditation Council for Continuing Medical Education, speakers, paper presenters/authors and staff (and the significant others of those mentioned) are asked to disclose any relationship they or their co-authors have with commercial interests.

Speakers, paper presenters/authors and staff (and the significant others of those mentioned) who have disclosed a relationship* with commercial interests are listed below.

Disclosure Reported

Rick Abbott, MD	Consultant	Johnson & Johnson
Ron L. Alterman, MD	Consultant	Medtronic, Inc.
	Honorarium	Medtronic, Inc.
Mohammad Nabiuni, PhD	Grants/Research Support	Hydrocephalus and Neuroscience Research Institute
Gregory J. Przybylski, MD	Consultant	Humana
	Consultant	United Health Group
	Consultant	Depuy Spine
Harold Louis Rekate, MD	Consultant	Codman, a Johnson and Johnson company
Paul Steinbok, MD	Consultant	Codman, a Johnson and Johnson company

*Relationship refers to receipt of royalties, consultantship, funding by research grant, receiving honoraria for educational services elsewhere, or any other relationship to a commercial company that provides sufficient reason for disclosure.

NON-DISCLOSURE INFORMATION

Speakers, their paper presenters/authors and staff (and the significant others of those mentioned) who have reported they do not have any relationships with commercial interests:

Edward S. Ahn, MD
Noam Alperin, PhD
Richard C. E. Anderson, MD
Kurtis Ian Auguste, MD
Anthony Michael Avellino, MD
Mirza N. Baig, MD, PhD
Patti Batchelder, MSN, CPNP
Benedicto Cortes Baronia, MD
Mony Benifla, MD
Bryan Bertoglio, MD
Frederick A. Boop, MD, FACS
Douglas L. Brockmeyer, MD
Samuel R. Browd, MD, PhD
Cuong J. Bui, MD
Michael James Burke, MD, FACS
Cathy Cartwright, MSN, RN
Jeffrey E. Catrambone, MD
Alan R. Cohen, MD, FACS
Daniel E. Couture, MD
Daniel J. Curry, MD
Moise Danielpour, MD
Laurence Davidson, MD
Mark S. Dias, MD
Ann-Christine Duhaime, MD
Susan R. Durham, MD
Sudesh J. Ebenezer, MD
Neil Arthur Feldstein, MD, FACS
Albert J. Fenoy, MD
Manuel Ferreira, Jr., MD, PhD
Susan Ferson, MSN
Nicholas Foreman, MD
David M. Frim, MD, FACS
Hugh J. L. Garton, MD, MHSc
Timothy M. George, MD
Holly S. Gilmer-Hill, MD
Liliana C. Goumnerova, MD, FRCS(C)
Paul A. Grabb, MD
Nalin Gupta, MD, PhD
Hannes Haberl, MD, PhD
Michael Hillel Handler, MD, FACS
Todd Cameron Hankinson, MD
Caroline Hayhurst, MD
Gregory G. Heuer, MD
Lewis Hou, MD
Kevin Hsieh, MD
Eric M. Jackson, MD
George I. Jallo, MD
Hector E. James, MD
Ramin J. Javahery, MD
Adele Johnson
Nathalie J. Johnson
James M. Johnston, Jr., MD
Vishal Kakar, MBBS, FRCS
Peter Kan, MD
Chris S. Karas, MD
Nadia Khan, MD
Paul Klimo, Jr., MD
Mark D. Krieger, MD
Richard Krugman, MD
Abhaya Vivek Kulkarni, MD, FRCS
Francois Lacour-Gayet, MD
Richard D. Lamm
Ilya Laufer, MD
Sean M. Lew, MD
Joseph R. Madsen, MD
Francesco Mangano, DO
James P. McAllister, PhD
David McAuley, MD
Patrick J. McDonald, MD, FRCS(C)
Patsy McGuire Cullen, RN, CPNP
Arnold H. Menezes, MD
A.M. Messing-Juenger, MD
Ichiro Nakano, MD MSc
Malini Visalam Narayanan, MD
Michael David Partington, MD, FACS, FA
Jogi Venkata Pattisapu, MD
Joseph H. Piatt, Jr., MD
Alexander K. Powers, MD
John Ragheb, MD
Elias B. Rizk, MD
Shenandoah Robinson, MD
Brandon Rocque, MD
David John Sacco, MD
Robert A. Sanford, MD
Daniel M. Sciubba, MD
Tania Shiminski-Maher, RN
Andrew Sirotnak, MD
Edward Robert Smith, MD
Jodi L. Smith, PhD MD
Mark M. Souweidane, MD
William James Thoman, MD
John Thorne, MD
Rachana Tyagi, MD
Nicole Ullrich, MD, PhD
Timothy Van Meter, PhD
Michael Vassilyadi, MD
Ken Rose Winston, II, MD
Jeffrey H. Wisoff, MD

ABSTRACT AUTHORS DISCLOSURE INFORMATION

The AANS controls the content and production of this CME activity and attempts to ensure the presentation of balanced, objective information. In accordance with the Standards for Commercial Support established by the Accreditation Council for Continuing Medical Education, speakers, paper presenters/authors and staff (and the significant others of those mentioned) are asked to disclose any relationship they or their co-authors have with commercial interests.

Speakers, paper presenters/authors and staff (and the significant others of those mentioned) who have disclosed a relationship* with commercial interests are listed below.

Noam Alperin, PhD
Stock Shareholder (directly purchased)
Alperin Noninvasive Diagnostics, Inc.

Ron L. Alterman, MD
Consultants, Honorarium
Medtronic, Inc.

Swinburne A. Augustine, PhD
Grants/Research Support
Hydrocephalus and Neuroscience Research Institute, University of Central Florida

David Frim, MD, PhD
Grants/Research Support
NIH

Mohamed Gharnit, none
Grants/Research Support
Hydrocephalus and Neuroscience Research Institute, University of Central Florida

Hannes Haberl, PhD, MD
Grants/Research Support
Aesculap

Scott Hunter, PhD
Grants/Research Support
NIH

George I. Jallo, MD
Grants/Research Support
Codman, Medtronic

Chris S. Karas, MD
Other Financial or Material Support
Intuitive Surgical

Maureen Lacy, PhD
Grants/Research Support
NIH

Martina Messing-Juenger, MD
Honorarium
Aesculap

Joan Miravite, FNP
Other Financial or Material Support
Medtronic, Inc.

Dawn Mottlow, RN, MSN
Grants/Research Support
NIH

Mohammad Nabiuni, PhD
Grants/Research Support
Hydrocephalus and Neuroscience Research Institute, University of Central Florida

Leena Paul, MA
Grants/Research Support
Hydrocephalus and Neuroscience Research Institute, University of Central Florida

Harold L. Rekate, MD
Consultants
Codman, a Johnson and Johnson company

Jay Shils, PhD
Honorarium
Medtronic, Inc.

Michele Tagliati, MD, DDS
Honorarium
Medtronic, Inc.

*Relationship refers to receipt of royalties, consultantship, funding by research grant, receiving honoraria for educational services elsewhere, or any other relationship to a commercial company that provides sufficient reason for disclosure.

NON-DISCLOSURE INFORMATION

Speakers, their paper presenters/authors and staff (and the significant others of those mentioned) who have reported they do not have any relationships with commercial interests:

Leslie Acakpo-Satchivi, MD, PhD
N S. Adzick, MD
Edward Ahn, MD
Edward S. Ahn, MD
Michael C. Ain, MD
Riyadh Al-Okaili, MD
Likhith Alakandy, FRCS
Yasmin Alanay, MD
Abdulghader Alfasi, MD
Richard Anderson, MD
Richard C. Anderson, MD
Richard C. E. Anderson, MD
Moumen Asbahi, BS
Kurtis I. Auguste, MD
Anthony M. Avellino, MD, FACS
Nathan Avery, MD
Carlos A. Bagley, MD
Linda Bagley, MD
Mirza Baig, MD, PhD
Anthony Barkovich, MD
Douglas Barnhart, MD
Benedicto C. Baronia, MD
Ute Bartels, MD
Anuj Basil, BS
John M. Beggs, PhD
Mony Benifla, MD
Craig Berg, BS
Marvin Bergsneider, MD
Bryan Bertoglio, MD
Erin Biro, MD
Marc Blayney, MD, FRCSC

Jefferey B. Blount, MD
Leif-Erik Bohman, BA
Marcus J. Bookland, MD
Frederick A. Boop, MD
Daniel Boue, MD, PhD
Ira Bowen, BA
William C. Broaddus, MD, PhD
Douglas L. Brockmeyer, MD
Samuel R. Browd, MD, PhD
Jeffrey Bruce, MD
Cuong Bui, MD
Michael J. Burke, MD, FACS
William E. Butler, MD
Neil Buxton, MD
Rashida Campwala, BA
Peter Canoll, MD, PhD
Ting Cao, BS
Peter W. Carmel, MD, DMSc
Benjamin S. Carson, MD
Michael Carter, MBBS, FRCS
Jeffrey E. Catrambone, MD
Andrew E. Chapman
Jessica Clevenger
Patrick Codd, BS
Alan R. Cohen, MD
Mark Cohen, MD
Chaim Colen, MD, PhD
William T. Couldwell, MD, PhD
Daniel E. Couture
Richard Cowie, FRCS
Kerry R. Crone, MD

John Curran, MD
Daniel Curry, MD
Daniel J. Curry, MD
Bradford Curt, MD
Simon Dagenais, PhD
Moise Danielpour, MD
Lisa David, MD
Laurence Davidson, MD
Brandon Davis, BA
Marc R. Del Bigio, MD, PhD
Bette K. DeMasters, MD
Mark S. Dias, MD
Peter B. Dirks, MD, PhD
Kathleen A. Donovan, ARNP, MSN
Christopher Dowd, MD
Anwar Dudekula, MD
Catherine I. Dumur, PhD
Susan R. Durham, MD
David Ebb, MD
Sudesh J. Ebenezer, MD
Michael S. Edwards, MD
Michael R. Egnor, MD
Richard G. Ellenbogen, MD, FACS
Michael J. Ellis, BSC
Scott Elton, MD
Scott W. Elton, MD
Murray Engel, MD
Elana Farace, PhD
Neil Feldstein, MD
Neil A. Feldstein, MD
Albert J. Fenoy, MD

Sherise Ferguson, MD
Serena Fernandes, BA
Manuel Ferreira, MD, PhD
Lolli Fleming, BS
Nicholas K. Foreman, MD
Kimberly Foster, BA
Kai U. Frerichs, MD
Ilona Frieden, MD
David Frim, MD, PhD
David M. Frim, MD
Heather J. Fullerton, MD
Hugh J. Garton, MD
James Garvin, MD
Ryan Gasser, BS
Vinod K. Gautam, MS
Christopher A. Gegg, MD
Daniel H. Geschwind, MD, PhD
Yashar M. Ghomri, BS
Floyd Gilles, MD
Holly Gilmer-Hill, MD
Steven Glazier, MD, FACS
Jill Glick, MD
Roberta Glick, MD
David Gonda, BS
Ignacio Gonzalez, MD
Ignacio Gonzalez-Gomez, MD
Judith Gooch, MD
Liliana C. Goumnerova, MD, FRCSC
Liliana C. Goumnerova, MD
Andrew W. Grande, MD
Heather L. Green, BA

NON-DISCLOSURE INFORMATION *continued*

Jeremy D. Greenlee, MD
James Guille, MD
Nalin Gupta, MD
Nalin Gupta, MD, PhD
E. M. Haacke, PhD
Steven Ham, MD
Steven D. Ham, DO
Todd C. Hankinson, MD
Caroline S. Hayhurst, MD
Gregory G. Heuer, MD, PhD
Robert A. Hirschl, MD
Jonathan P. Hobbs, BS
Caitlin E. Hoffman, BA
Scott K. Holland, PhD
James W. Holsapple, MD
Steve Horvath, MD
Lewis C. Hou, MD
Kevin E. Hsieh, MD
Robert W. Hurst, MD
Bermans J. Iskandar, MD
Joy Ito, RN
Eric M. Jackson, MD
Hector E. James, MD
Ramin J. Javahery, MD
Jennifer Jennings, MD
Mark P. Johnson, MD
James M. Johnston, MD
Blaise V. Jones, MD
Vishal Kakar, MBBS, FRCS
Paul Kalapos, MD
Peter Kan, MD

Chris Karas, MD
Reza Karmini, MD
Bruce A. Kaufman, MD
Alan Kay, PhD
Michael Kazim, MD
John Kestle, MD
John R. Kestle, MD
Henry Kestler, MD
Alex Khalessi, MD
Amer Khalil, MD
Nadia Khan, MD
Mark W. Kieran, MD, PhD
Peter Kim, MD
Leslie J. Kim-Cunningham, PhD
Brent Kimball, BS
Paul Klimo, MD, MPH
Harley I. Kornblum, MD, PhD
Edward J. Kosnik, MD
Dory Kranz
Dory Kranz, BS
Mark D. Krieger, MD
Sandhya Krishnan
Abhaya V. Kulkarni, MD, PhD
Maria Lamberti-Pasculli, RN
Samir Lapsiwala, MD
Eric Larsen, PhD
Ilya Laufer, MD
Suzzane Laughlin, MD
Jorge A. Lazareff, MD
Jeff Leonard, MD
Sean M. Lew, MD

Jie Li, MD, MBA
Xuemei Liang, PhD
Linda Liau, MD, PhD
Kenneth Liu, MD
Mark G. Luciano, MD, PhD
Joseph R. Madsen, MD
Suresh Magge, MD
Suresh N. Magge, MD
Conor L. Mallucci, MD
Francesco T. Mangano, DO
Sunil Manjila, MD
Geoffrey Manley, MD, PhD
Karen J. Marcus, MD
Neena I. Marupudi, MS
Michael Masterman-Smith
Mary-Ann Matzinger, MD, FRCSC
Paul May, MD
Paul L. May, MD
James P. McAllister, PhD
David McAuley, FRCS
Lori A. McBride, MD
Craig D. McClain, MD
J. G. McComb, MD
J. Gordon McComb, MD
Morgan McCrocklin
Patrick J. McDonald, MD, FRCSC
Sean McNatt, MD
Zarui Melikyan, PhD
Arnold H. Menezes, MD
Thomas E. Merchant, DO
Denise Metry, MD

Griffin Meyers, BA
Janet M. Miller, PhD
Matthew L. Miller, MD
Paul Mischel, MD
J Mocco, MD
J D. Mocco, MD
Traci Morgan, RN
Joseph Morreale, MD
Patricia Mortenson, MSc
Wade Mueller, MD
Karin M. Muraszko, MD
Cheryl A. Muszynski, MD
Ichiro Nakano, MD, MSc
Malini Narayanan, MD, PhD
Malini Narayanan, MD, MS
Malini V. Narayanan, MD, MS
Stanley Nelson, MD, PhD
K.Y. S. Ng, PhD
Isamah T. Nneka
Joseph C. Noggle
Donnacha F. O'Brien, MD
Bert W. O'Malley, MD
Walter J. Oakes, MD
Alfred Ogden, MD
Jeffrey G. Ojemann, MD, FACS
Gregory Olavarria, MD
Andrew Olsen, BS
Tae Sung Park, MD
Joel Parraghi
Savannah C. Partridge, PhD
Hema Patel, MD

NON-DISCLOSURE INFORMATION *continued*

Anne Paterson
Jogi V. Pattisapu, MD
Blake Pearson, MD
Victor Perry, MD
Victor L. Perry, MD
Sergey Persits, MD
Scott L. Pomeroy, MD, PhD
Alexander K. Powers, MD
Charles Prestigiacomo, MD
Angela Price, MD
Mark Proctor, MD
Tiffany Prugpichailers
Ben Pykkonnen
Brian T. Ragel, MD
Ali Raja, MD
Gigi Raymon, CRNP
Celiane Rey-Casserly, PhD
Roberts Richard, MD
Paul W. Richardson
David Rimoin, MD, Prof
Elias Risk, MD
Elias B. Rizk, MD
Brandon Rocque, MD
Rhonda Roell-Werner, RN
David Rosen, MD
James T. Rutka, MD, PhD
David J. Sacco, MD
Tiffany Sakleh, PA-C
Elise P. Salerno, MS
Steven O. Salley, PhD
Amer Samdani, MD

Robert A. Sanford, MD
Yutaka Sato, MD
Michael Schulder, MD
Michael J. Schwabe, MD
Daniel M. Schwartz, PhD
Daniel M. Sciubba, MD
R. M. Scott, MD
R. Michael Scott, MD
Nathan Selden, MD, PhD
Iffat Shams, MD, MPH
Dennis W. Shaw, MD
Jonas Sheehan, MD, FACS
Yimin Shen, PhD
Mohammad S. Shukairy, MD
Swati Singh, MD
Ashutosh Singhal, MD, FRCSC
Frederick Sklar, MD
Edward R. Smith, MD
Jodi L. Smith, PhD, MD
Matthew Smyth, MD
Sandeep Sood, MD
Mark M. Souweidane, MD
Kelly Staley, MD
Hans-Jakob Steiger, MD
Paul Steinbok, MBBS, BSc
Curt Stewart, MP, MS
Michael F. Stiefel, MD, PhD
Philip B. Storm, MD
Amy L. Sun
Peter Sun, MD
Peter P. Sun, MD

Leslie N. Sutton, MD
Louise Sweeney
Dale Swift, MD
Haiying Tang, BS
Zachary Tataryn
William J. Thoman, MD
John Thorne, MD
Tadanori Tomita, MD
Theo Trigylidas
Victor K. Tse, MD, PhD
R S. Tubbs, PhD, PA-C
Richard S. Tubbs, PhD, PA-C
Rachana Tyagi, MD
Gary W. Tye, MD
Nicole Ullrich, MD, PhD
Petra v. Berenberg, MD
Timothy E. Van Meter, PhD
Michael Vassilyadi, MD, FRCSC
Ram R. Vasudevan, MD
Ventureyra
Enrique C. Ventureyra, MD, FRCSC
Alan S. Verkman, MD, PhD
Mark E. Wagshul, PhD
Marion Walker, MD
Marion E. Walker, MD
Marion L. Walker, MD
Anfeng Wang, PhD
John D. Ward, MD
James Washek, MD
John B. Weigele, MD, PhD
Edward Weinberger, MD

James Weisfeld-Adams, MBBS, BSc
Donald Weisz, PhD
John C. Wellons, III, MD
Bradley Weprin, MD
Georgia Wiesner, MD
Bill Wilcox, MD
C Corbett Wilkinson, MD
Michael A. Williams, MD
Luisa Wilms
Ken Winston, MD
Jeffrey Wisoff, MD
David L. Wood, MD
Audie Wooley, MD
Neill Wright, MD
Bakhtiar Yamini, MD
Yasuhiro Yonekawa, MD
Weihong Yuan, PhD
Sung J. Yuh, BSC
Igor Yusupov, MD
Kareem A. Zaghloul, MD, PhD
Erica Zerfoss, BA
Frank Zimmerman, MD
Mary L. Zupanc, MD
Marike Zwieneberg-Lee, MD

ORAL ABSTRACTS LISTING

1. **Cavarial Growth Following Surgical Treatment of Craniosynostosis**
   Alex Khalessi, MD; Mark D. Krieger, MD; Ira Bowen; J. Gordon McComb, MD (Los Angeles, CA)

2. **Problems in Craniosynostosis: Elevated ICP as Measured by LP as an Adjunct to Management**
   Malini V. Narayanan, MD, MS; David Frim, MD, PhD; Bakhtiar Yamini, MD, Daniel Curry, MD (Chicago, IL)

3. **Long-term Outcome of Infants with Positional Occipital Plagiocephaly**
   Paul Steinbok, MBBS, BSc, BC; Swati Singh, MD; Patricia Mortenson, MSc; Ashutosh Singhal, MD, FRCSC (Vancouver, British Columbia, Canada)

4. **Correction of Frontal Bossing After Spring Mediated Cranioplasty for Sagittal Synostosis**
   Alexander K. Powers, MD; Heather L. Green, BA; Lisa David, MD; Steven Glazier, MD, FACS (Winston-Salem, NC)

5. **The Normal Level of Termination of the Conus Medullaris in Children**
   Mark S. Dias, MD; Henry Kestler, MD; Paul Kalapos, MD (Hershey, PA)

6. **Cardiological Evaluation of Chiari 1-Related Drop Attacks**
   David Frim, MD, PhD; Kimberly Foster, BA; Frank Zimmerman, MD (Chicago, IL)

7. **Symptomatology of Chiari Malformation Type 1 in Patients Under Age 5**
   Malini Narayanan, MD, MS; David Frim, MD, PhD (Chicago, IL)

8. **Autologous Duraplasty in Chiari Type I Malformation**
   Caitlin E. Hoffman, BA; Isamah T. Nneka; Mark M. Souweidane, MD (New York, NY)

9. **Intraoperative Neurophysiological Monitoring in Patients Undergoing Tethered Cord Surgery after Fetal Myelomeningocele Repair**
   Eric M. Jackson, MD; Daniel M. Schwartz, PhD; N. Scott Adzick, MD; Mark P. Johnson, MD; Leslie N. Sutton, MD (Philadelphia, PA)

10. **The Chiari I Malformation in the Very Young Pediatric Population**
    Arnold H. Menezes, MD; Kathleen A. Donovan, ARNP, MSN (Iowa City, IA)

11. **Operative Complications, Fusion Rate and Neurologic Outcome After Surgical Stabilization of Thoracolumbar Fractures in Children**
    James M. Johnston, MD; Neill Wright, MD; Matthew Smyth, MD; Tae Sung Park, MD; Jeff Leonard, MD (St. Louis, MO)

12. **Surgical Management of Atlanto-axial Instability in Children**
    John Thorne, MD; Likhith Alakandy, FRCS; Richard Cowie, FRCS (Manchester, United Kingdom)

13. **Selection of Rigid Internal Fixation Construct for Stabilization at the Craniovertebral Junction in Pediatric Patients**
    Richard C. E. Anderson, MD (New York, NY); Brian T. Ragel, MD, (Salt Lake City, UT); J. Mocco, MD (New York, NY); Leif-Erik Bohman, BA (New York, NY); Douglas L. Brockmeyer, MD (Salt Lake City, UT)

14. **Occipitocervical Instrumentation in the Pediatric Population using the ABT Loop System: Initial Results and Long-term Follow-up**
    Daniel E. Couture (Salt Lake City, UT); Nathan Avery, MD (Flagstaff, AZ); Douglas L. Brockmeyer, MD (Salt Lake City, UT)

15. **Screw Fixation of the Upper Cervical Spine in The Pediatric Population**
    David J. Sacco, MD; Bradley Weprin, MD; Frederick Sklar, MD; Dale Swift, MD; Angela Price, MD (Dallas, TX)

16. **Spinal Stenosis in Pediatric Achondroplasia**
    Daniel M. Sciubba, MD; Neena I. Marupudi, MS; Marcus J. Bookland, MD; Carlos A. Bagley, MD; Joseph C. Noggle; Michael C. Ain, MD; Benjamin S. Carson, MD; George I. Jallo, MD (Baltimore, MD)

17. **Our Recent Experience with Primary Cranial Vault Encephaloceles: 44 Cases**
    Cuong Bui, MD; Richard S. Tubbs, PhD, PA-C; Elise P. Salerno, MS; Blake Pearson, MD; Leslie J. Acakpo-Satchivi, MD, PhD (Birmingham, AL); John C. Wellons, III, MD; Jefferey B. Blount, MD; Walter J. Oakes, MD (Birmingham, AL)

18. **Evaluation of MRI-based Measurement of ICP in Pediatric Patients: Early Results**
    Noam Alperin, PhD; Joy Ito, RN; Tadanori Tomita, MD; John Curran, MD; Roberta Glick, MD (Chicago, IL)

19. **The Application of Electromagnetic Image Guidance Technology in Paediatric Neurosurgery**
    Caroline S. Hayhurst, MD; Neil Buxton, MD; Paul L. May, MD; Conor L. Mallucci, MD (Liverpool, United Kingdom)

20. **Pallidal Deep Brain Stimulation for Dystonia in Pediatric Patients**
    Ron L. Alterman, MD; Joan Miravite, FNP (New York, NY); Jay Shils, PhD (Boston, MA); Donald Weisz, PhD; Michele Tagliati, MD, DDS (New York, NY)

21. **Surgical Treatment of Spasticity in Children: Comparison of Selective Dorsal Rhizotomy and Intrathecal Baclofen Pump Implantation**
    Peter Kan, MD; John Kestle, MD; Marion Walker, MD; Judith Gooch, MD (Salt Lake City, UT)

22. **CT/MRI Fusion for Neuronavigation in Subdural Grid Based Epilepsy Surgery: Technical Note**
    James M. Johnston, MD; Matthew Smyth, MD (St. Louis, MO)

23. **Epilepsy Surgery Outcome in 83 Pediatric Patients - The Children's Hospital of Wisconsin Experience**
    Sean M. Lew, MD; Mary L. Zupanc, MD; Rhonda Roell-Werner, RN; Michael J. Schwabe, MD; Wade Mueller, MD (Milwaukee, WI)

24. **Management of Vagal Nerve Stimulator Infections- Do They Need to be Removed?**
    Rachana Tyagi, MD; Yashar M. Ghomri, BS; Andrew W. Grande, MD; Bradford Curt, MD; Kerry R. Crone, MD; Francesco T. Mangano, DO (Cincinnati, OH)

25. **Electrophysiological Analysis Comparing Epileptogenic Human Cortex and Hyperexcited Rat Cortex**
    Jodi L. Smith, PhD, MD (Indianapolis, IN); Jonathan P. Hobbs, BS (Bloomington, IN); Hema Patel, MD (Indianapolis, IN); John M. Beggs, PhD (Bloomington, IN)

26. **Early Obstacles to Complex Intraventricular Robotic Surgery: Neurosurgical Considerations for the DaVinci Surgical Robot**
    Chris S. Karas, MD (Columbus, OH)

27. **Predictors of Shunt Survival After Revision**
Sherise Ferguson, MD; Griffin Meyers, BA; David Rosen, MD; David Frim, MD, PhD (Chicago, IL)

28. **Hydrocephalus, Cognition, and Acute Changes in Intracranial Pressure**
Ben Pykkonnen; Scott Hunter, PhD; Eric Larsen, PhD; Maureen Lacy, PhD; Dawn Mottlow, RN, MSN; David Frim, MD, PhD (Chicago, IL)

29. **6 Years Experience with Gravitational Valves for Pediatric Hydrocephalus Patients**
Martina Messing-Juenger, MD; Luisa Wilms; Sergey Persits, MD; Hans-Jakob Steiger, MD (Dusseldorf, Germany)

30. **Clinical Performance of a Gravity Assisted Valve in a Pediatric Population**
Hannes Haberl, PhD, MD; Paedi-Gav Study Group; Petra V. Berenberg, MD (Berlin, Germany)

31. **Long Term Success Following Shunt Revision by the Percutaneous Endoscopic Recanalization of Catheter (PERC) Technique**
Jogi V. Pattisapu, MD; Christopher A. Gegg, MD; Gregory Olavarria, MD (Orlando, FL)

32. **Predictors of Quality of Life in Children with Hydrocephalus**
Abhaya V. Kulkarni, MD, PhD; Iffat Shams, MD, MPH (Toronto, Ontario, Canada)

33. **Interobserver Agreement in Assessing Shunt Failure**
Hugh J.L. Garton, MD; Sandhya Krishnan; Karin M. Muraszko, MD (Ann Arbor, MI)

34. **Poor Flow on Ventricular Shunt Tap is Highly Predictive of Proximal Catheter Shunt Malfunction**
Brandon Rocque, MD; Samir Lapsiwala, MD; Bermans J. Iskandar, MD (Madison, WI)

35. **Effects of Different CSF Obstruction Sites in Experimental Communicating Hydrocephalus**
James P. McAllister, PhD; Jie Li, MD, MBA; Joel Parraghi; Janet M. Miller, PhD; Yimin Shen, PhD (Detroit, MI); Michael R. Egnor, MD; Mark E. Wagshul, PhD (Stony Brook, NY); E. Mark Haacke, PhD (Detroit, MI); Curt Stewart, MP, MS (Carefree, AZ); Marion E. Walker, MD (Salt Lake City, UT); Steven D. Ham, DO (Detroit, MI)

36. **Priorities for Hydrocephalus Research: Report from the NIH-sponsored Workshop "Hydrocephalus: Myths, New Facts, Future Directions"**
James P. McAllister, PhD (Detroit, MI); Michael A. Williams, MD (Baltimore, MD); Marion L. Walker, MD (Salt Lake City, UT); Dory Kranz, BS (San Francisco, CA); Lolli Fleming, BS (West Roxbury, MA); Marvin Bergsneider, MD (Los Angeles, CA); Marc R. Del Bigio, MD, PhD (Winnepeg, MB, Canada); David M. Frim, MD (Chicago, IL); John R.W. Kestle, MD (Salt Lake City, UT); Mark G. Luciano, MD, PhD (Cleveland, OH); Joseph R. Madsen, MD (Boston, MA)

38. **The Belfast Experience Using Optic Nerve Sheath Ultrasound in the Assessment of Pediatric Hydrocephalus**
David McAuley, FRCS; Anne Paterson; Louise Sweeney (Belfast, United Kingdom)

39. **Outcome Analysis of Shunt Valve Pressure Relative to Shunt Malfunction in Children**
Holly Gilmer-Hill, MD; Mohammad S. Shukairy, MD; Chaim Colen, MD, PhD; Tiffany Sakleh, PA-C; James P. McAllister, PhD; Sandeep Sood, MD; Steven Ham, MD (Detroit, MI)

40. **Percuntaneous Gastrotomy and Nissen Fundoplication Related Infections of Pediatric Cerebral Fluid Shunts**
Cuong Bui, MD; Richard S. Tubbs, PhD, PA-C; Gigi Raymon, CRNP; Traci Morgan, RN; Elise P. Salerno, MS; Douglas Barnhart, MD; Leslie J. Acakpo-Satchivi, MD, PhD; John C. Wellons, III, MD; Walter J. Oakes, MD; Jefferey P. Blount, MD (Birmingham, AL)

41. **Cerebral Mantle Reconstitution after Shunting Infants at Children's Hospital of Eastern Ontario with Severe Hydrocephalus**
Benedicto C. Baronia, MD; Vassilyadi Ventureyra; Abdulghader Alfasi, MD (Ottawa, Ontario, Canada)

42. **Antibiotic Impregnated Shunt (AIS) Components are Safe and Efficacious in the Treatment of Infantile Hydrocephalus**
Daniel M. Sciubba, MD; Joseph C. Noggle; Neena I. Marupudi, MS; George I. Jallo, MD (Baltimore, MD)

43. **Internal Cranial Expansion for the Treatment of Slit Ventricle Syndrome: A Technical Note**
Todd C. Hankinson, MD; J. D. Mocco, MD; Brent Kimball, BS; Richard C. E. Anderson, MD; Neil A. Feldstein, MD (New York, NY)

44. **Virtual Reality Neurendoscopy**
Jeffrey E. Catrambone, MD; Reza Karmini, MD; Michael Schulder, MD; Peter W. Carmel, MD, DMSc (Newark, NJ)

45. **Demographics and Treatment of Severe Headaches in Children and Young Adults with Shunts**
Harold L. Rekate, MD (Phoenix, AZ); Nalin Gupta, MD; Dory Kranz (San Francisco, CA)

46. **Familial Intracranial Dermoids: Etiopathogenesis and Management Strategies**
Sunil Manjila, MD; Mark Cohen, MD; Georgia Wiesner, MD; Alan R. Cohen, MD (Cleveland, OH)

47. **Patterns of Treatment and Tumor Progression in Pediatric Optic Pathway Gliomas**
Rashida Campwala, BA; Mark D. Krieger, MD; Ira Bowen, BA; J. Gordon McComb, MD (Los Angeles, CA)

48. **Radical Resection of Pediatric Craniopharyngiomas and the Long Term Effects on Quality of Life**
Kevin E. Hsieh, MD; Jeffrey Wisoff, MD (New York, NY)

49. **Optic Pathway Glioma; A New Surgical Observation**
Jessica Clevenger; Marike Zwieneberg-Lee, MD; Frederick A. Boop, MD; Robert A. Sanford, MD (Memphis, TN)

50. **Treatment of Recurrent Ependymoma**
Marike Zwienenberg-Lee, MD; Frederick A. Boop, MD; Thomas E. Merchant, DO; Robert A. Sanford, MD (Memphis, TN)

51. **Long-term Survival in Patients Diagnosed with Atypical Teratoid/Rhabdoid Tumors**
Manuel Ferreira, MD, PhD; David Ebb, MD; William E. Butler, MD (Boston, MA)

52. **The Role of Neurosurgical Management in Children with Langerhans Cell Histiocytosis**
Laurence Davidson, MD; J. Gordon McComb, MD; Ira Bowen, BA; Mark D. Krieger, MD (Los Angeles, CA)

53. **Radiation-induced Injury Following Gamma Knife Stereotactic Radiosurgery in Pediatric Patients with Intracranial Tumors and Arteriovenous Malformations**
Lewis C. Hou, MD; Amy L. Sun; Tiffany Prugpichailers; Victor K. Tse, MD, PhD; Michael SB Edwards, MD (Stanford, CA)

54. **Brainstem Lesions in Neurofibromatosis 1**
Nicole J. Ullrich, MD, PhD; Ali Raja, MD; Mark W. Kieran, MD, PhD; Karen J. Marcus, MD; Liliana Goumnerova, MD (Boston, MA)

55. **Abnormal Diffusion Characteristics in Pediatric Supratentorial Brain Tumor, a DTI Study.**
Andrew W. Grande, MD; Weihong Yuan, PhD; Scott K. Holland, PhD; Blaise V. Jones, MD; Kerry R. Crone, MD; Francesco T. Mangano, DO (Cincinnati, OH)

56. **Gene Expression Profiling of Malignant Rhabdoid Tumors and the Implications**
Manuel Ferreira, MD, PhD; Scott L. Pomeroy, MD, PhD, (Boston, MA)

57. **Micro array Profiling of Childhood Ependymoma Identifies a Distinct Gene Subset Related to AKT2 Over expression.**
Timothy E. Van Meter, PhD; Gary W. Tye, MD; Morgan McCrocklin; John D. Ward, MD; Catherine I. Dumur, PhD; William C. Broaddus, MD, PhD (Richmond, VA)

58. **Greatly Impaired Migration of Aquaporin-4 Deficient Astroglial Cells After Implantation into Mouse Brain**
Kurtis I. Auguste, MD; Geoffrey Manley, MD, PhD; Victor Perry, MD; Peter Sun, MD; Nalin Gupta, MD; Alan S. Verkman, MD, PhD (San Francisco, CA)

59. **Spontaneous Hemorrhage in Pediatric Brain Tumors**
Mony Benifla, MD; Suzzane Laughlin, MD; Ute Bartels, MD; Maria Lamberti-Pasculli, RN; James T. Rutka, MD, PhD; Peter B. Dirks, MD, PhD (Toronto, Ontario, Canada)

60. **Identification of Inhibitors of Pediatric Brain Tumor Stem Cells**
Ichiro Nakano, MD, MSc; Michael Masterman-Smith; Jorge A. Lazareff, MD; Steve Horvath, MD; Linda Liau, MD, PhD; James Washek, MD; Daniel H. Geschwind, MD, PhD; Stanley Nelson, MD, PhD; Paul Mischel, MD; Harley I. Kornblum, MD, PhD (Los Angeles, CA)

61. **Primary Vertebral Neoplasms in the Pediatric Patient**
Albert J. Fenoy, MD; Arnold H. Menezes, MD; Jeremy D.W. Greenlee, MD; Kathleen A. Donovan, ARNP, MSN; Yutaka Sato, MD (Iowa City, IA)

62. **Aquaporin-1 Membrane Channel Protein Level is Decreased in Developing H-Tx Rat Brains**
Mohammad Nabiuni, PhD; Swinburne A. Augustine, PhD; Leena Paul, MA; Mohamed Gharnit; Jogi V. Pattisapu, MD (Orlando, FL)

63. **Subdural Hematoma in the Setting of Subarachnomegaly**
Daniel J. Curry, MD; Malini Narayanan, MD, PhD; Bakhtiar Yamini, MD; David Frim, MD, PhD; Kelly Staley, MD; Jill Glick, MD (Chicago, IL)

64. **Folate Receptor Function is Essential in CNS Recovery after Injury: Evidence in Knockout Mice**
Elias B. Rizk, MD (Harrisburg, PA); Bermans J. Iskandar, MD (Madison, WI)

65. **Repeat CT Imaging in Pediatric Traumatic Brain Injury: When Does it Make a Difference?**
Susan R. Durham, MD (Lebanon, NH); Kenneth Liu, MD; Nathan Selden, MD, PhD (Portland, OR)

66. **The Open Terminal Myelocystocele: An "Exposed" Neural Tube Defect of Secondary Neurulation**
Michael J. Burke, MD, FACS (Corpus Christi, TX)

67. **Dynamic Cervicomedullary Cord Compression and Alterations in Cerebrospinal Fluid Dynamics in Children with Achondroplasia**
Moise Danielpour, MD; Bill Wilcox, MD; Yasmin Alanay, MD; David Rimoin, MD, Prof (Los Angeles, CA)

68. **Modified Osteoplastic Orbitozygomatic Craniotomy in the Pediatric Population**
Matthew L. Miller, MD; Sean M. Lew, MD; Cheryl A. Muszynski, MD; Bruce A. Kaufman, MD (Milwaukee, WI)

69. **Analysis of Subdural Empyema: A Retrospective Study**
Jeffrey E. Catrambone, MD; Serena Fernandes, BA; Charles Prestigiacomo, MD; Peter W. Carmel, MD, DMSc (Newark, NJ)

70. **Central Nervous System Blastomycosis in Children-The University of Manitoba Experience**
Michael J. Ellis, BSC; Patrick J. McDonald, MD, FRCSC (Winnipeg, MB, Canada)

71. **Transitioning the Spina Bifida Patient to an Adult Medical Home: The Jacksonville Experience**
Hector E. James, MD; David L. Wood, MD (Jacksonville, FL)

72. **Increased Risk of Wound Infection with the Use of BioGlue**
Paul Klimo, MD, MPH; Amer Khalil, MD; Liliana C. Goumnerova, MD (Boston, MA)

73. **Choice of Surgical Revascularization in Childhood Moyamoya Angiopathy**
Nadia Khan, MD; Yasuhiro Yonekawa, MD (Zurich, Switzerland)

74. **Moyamoya Associated With Sickle Cell Disease: Outcome Following Surgical Revascularization**
Edward R. Smith, MD; Craig D. McClain, MD; R. Michael Scott, MD (Boston, MA)

75. **Chorea in Association with Moyamoya Syndrome: Results of Surgical Revascularization and a Proposed Clinicopathological Correlation**
Edward S. Ahn, MD; Andrew E. Chapman; Edward R. Smith, MD; R. Michael Scott, MD (Boston, MA)

76. **The Spectrum of Cerebrovascular Anomalies Encountered in PHACES Syndrome**
Kurtis I. Auguste, MD; Brandon Davis, BA (San Francisco, CA); Denise Metry, MD (Houston, TX); Heather J. Fullerton, MD; Victor L. Perry, MD; Peter P. Sun, MD; Christopher Dowd, MD; Anthony Barkovich, MD; Ilona Frieden, MD (San Francisco, CA); Nalin Gupta, MD, PhD (San Francisco, CA)

ORAL ABSTRACTS

1. **Cavarial Growth Following Surgical Treatment of Craniosynostosis**
Alex Khalessi, MD; Mark D. Krieger, MD; Ira Bowen; J. Gordon McComb, MD (Los Angeles, CA)
Introduction: Calvarial growth may represent a viable outcome measure for the surgical treatment of craniosynostosis.
Methods: 117 children were surgically treated for craniosynostosis at a single institution from 2000 to 2005. Head circumference (HC) measurements were retrospectively reviewed pre-operatively, immediately post-operatively (1-2 weeks), and at short-term follow-up (6 months to 1 year). Using population-based HC growth curves, data points were assigned a percentile score. Subjects were classified into three post-operative outcome states: (1) patient HC remained stable,(2) patient HC moved to a lower percentile growth curve, and (3) patient HC moved to a higher growth curve.
Results: Study population descriptive statistics were as follows: mean age 9 months, gender breakdown: 26% female and 74% male, and follow-up from 3 to 56 months (mean 18 months). Subsets included: isolated sagittal synostosis (ISS)(59%), coronal synostosis (18%), metopic (5%), lambdoidal (5%), and multiple suture synostosis (MSS)(13%). ISS and MSS populations demonstrated divergent outcomes. Eighty-nine percent of MSS patients moved to higher HC percentile curves post-op, all experienced absolute HC increases. 50% of ISS patients moved to a lower HC percentile curve post-op the only synostosis subset to do so. Remaining ISS patients divided evenly among stable (27%) and increased (23%) HC-percentile groups
Conclusions: Serial HC measurement may meaningfully quantify the efficacy and degree of surgical correction for craniosynostosis. In MSS, multi-dimensional suture release may relieve restrictions on normal brain development and correspond with increased calvarial growth. The scaphocephalic deformity of ISS, by contrast, leads to a disproportionately increased HC relative to cranial vault volume preoperatively. Sagittal suture release restores a more anatomic, spherical cranial vault volume relationship and continued normal growth. Decreased percentile HC growth, as demonstrated by our study population, may therefore represent a successful surgical result in ISS patients.

2. **Problems in Craniosynostosis: Elevated ICP as Measured by LP as an Adjunct to Management**
Malini V. Narayanan, MD, MS; David Frim, MD, PhD; Bakhtiar Yamini, MD, Daniel Curry, MD (Chicago, IL)
Introduction: We report our experience with elevated intracranial pressure (ICP) and its involvement in clinical decision making for patients with craniosynostosis. Though much has been written regarding elevated ICP and craniosynostosis, there is little discussion about the clinical significance of preoperative measurements of ICP (via lumbar puncture (LP)) in patients with craniosynostosis.
Methods: We reviewed nine patients with mild craniosynostosis (both single and multiple sutural) where indications for surgery on anatomical grounds were weak; however, all patients had evidence of developmental delay or headaches. ICP was measured by LP under general anesthesia with controlled pCO2.
Results: Eight of nine patients had elevated ICPs (>21 cm of water). One patient, with an ICP of 17 did not undergo surgical repair. The ICP measured in the group was 26 +/- 7.1 (mean +/- SD). Five out of 8 operated patients had recurrent headaches and underwent ICP measurement showing elevated ICP. In the other 3 operated patients, no postoperative ICP measurement was performed as symptoms resolved.
Conclusions: LP under general anesthesia has been used as a minimally invasive measurement of raised intracranial pressure in craniosynostosis patients where management is ambiguous. Surgical intervention on patients with raised ICP did resolve symptomatology in only 38% (3/8) patients; however, raised ICP persisted despite surgical repair in the remainder (5/8, 62%) of these children.

3. **Long-term Outcome of Infants with Positional Occipital Plagiocephaly**
Paul Steinbok, MBBS, BSc, BC; Swati Singh, MD; Patricia Mortenson, MSc; Ashutosh Singhal, MD, FRCSC (Vancouver, British Columbia, Canada)
Introduction: Despite much interest in positional plagiocephaly (PP), the natural history is unclear. The purpose of this study was to determine cosmetic and developmental outcomes, as well as the impact of cranial orthotic use, at a minimum of five years of age in children diagnosed in infancy with PP.
Methods: Questionnaire survey of parents of children diagnosed with PP in infancy. We performed a retrospective chart review of study patients and prospective follow-up in those families agreeing to return for assessment.
Results: Of 278 children with PP, questionnaires were completed by 66 parents, and 28 brought their child for reassessment. Participants and non-participants were similar. Median age of study patients was 8.8 years. Cranial orthoses were used in 18 of 66 children. Parents perceived cosmetic appearance of their child as "very abnormal" 2, "mildly abnormal" 25 and "normal" 39. Residual asymmetry was noted by parents in 59%, but only 21% were concerned about cosmetic appearance. In the year preceding the questionnaire completion, 7.5% of children commented about head asymmetry and 4.5% were teased occasionally. Thirty-three % had received learning assistance and 14% were in a special class. All parents of children using an orthosis felt that the device had improved head shape in the short term. However, longer term outcomes, as perceived by the parent or child, were no different between children with and without orthosis use.
Conclusions: The results allow better counseling of parents about outcome of infants with PP, reducing anxiety for these parents, and more rational selection of management modality.

4. **Correction of Frontal Bossing After Spring Mediated Cranioplasty for Sagittal Synostosis**
Alexander K. Powers, MD; Heather L. Green, BA; Lisa David, MD; Steven Glazier, MD, FACS (Winston-Salem, NC)
Introduction: Multiple procedures exist for the treatment of sagittal synostosis, each varying to the extent of operation and ability to objectively return the calvarium to a more normal shape. Dynamic spring cranioplasty has been shown to normalize cephalic index, and when compared to more extensive calvarial reshaping procedures, has been proven to require less operative time, less blood loss, and shorter hospital stay. Limitations exist with the cephalic index, therefore we describe a new technique for the analysis of changes in cranial dimensions.
Methods: Serial calvarial scans were acquired with a FastScan Laser Scanner since March 2004 on 50 patients that underwent spring mediated cranioplasty. Seventeen patients received pre- and post-operative scans with a mean follow-up of 7.05 months. Cranial volumetric data were calculated using the Delta Scan Utility, Version 1.2.2.
Results: Seventeen children (13 male, 4 female) underwent pre and postoperative scanning with a mean follow-up of 7.05 months. The anterior 1/3 of the cranial vault grew 23%, while the ratio of the volume of the anterior 1/3 to the volume of the entire cranial vault decreased 11.97%. Preoperative mean cephalic index was 68.1 which corrected to 74.8 during that same period.
Conclusions: This study finds that spring mediated cranioplasty allows for controlled expansion of the cranial vault so that the proportion of the volume of the anterior 1/3 of the cranial vault to the total volume is decreased. These measurements were collected with a surface laser scanner that may offer a useful, radiation-free option for quantitating cephalometrics as well as frontal bossing.

ORAL ABSTRACTS *continued*

5. **The Normal Level of Termination of the Conus Medullaris in Children**
Mark S. Dias, MD; Henry Kestler, MD; Paul Kalapos, MD (Hershey, PA)
Introduction: The normal level of the conus medullaris has been studied in cadavers, CT/myelography and MRI with the conus thought to lie opposite or cranial to the L1-2 disc space. However previous series have included 'normal' individuals with coni well below this level and included patients with back pain or other symptoms potentially caused by tethering, creating a potential selection bias. Moreover, these studies have usually not 'counted down from the top', potentially introducing counting errors. We hypothesized that children with brain tumors undergoing whole spine screening for leptomeningeal seeding would comprise a more 'normal' control group for examining the termination of the conus.
Methods: All children with brain tumors undergoing whole spine MRI were identified. Vertebrae were counted sequentially from C1. The number of rib bearing segments was quantified and any congenital abnormalities were noted. The level of the conus was determined with reference to the adjacent vertebrae with each segment divided into cranial, middle, and caudal vertebra and the subjacent disc space.
Results: The level of termination of the conus medullaris was tightly centered about the L1-2 disc space with very little variation. No conus ended below the mid-body of L2.
Conclusions: The conus medullaris terminates most commonly at the L1-2 disc space, and virtually never ends below the mid-body of L2. Any conus ending below this level should be considered to be abnormal and potentially tethered.

6. **Cardiological Evaluation of Chiari 1-Related Drop Attacks**
David Frim, MD, PhD; Kimberly Foster, BA; Frank Zimmerman, MD (Chicago, IL)
Introduction: Chiari syndrome can present, albeit rarely, with stereotypic fainting spells and dizziness termed Chiari drop attacks. The relationship of this symptom to cardiac anomalies and the effects of surgical decompression are not well described.
Methods: 17 patients with Chiari malformation type 1 (CM1) and drop attacks, syncope, dizziness were referred for cadiological evaluation including complete history/physical exam, EKG, echocardiogram, and tilt table testing. 10 of the 17 eventually underwent Chiari decompression. Charts were reviewed for test results and outcome.
Results: No patient presented with abnormal EKG or structural cardiac anomaly. 6 of 17 patients were found to have positive tilt table exams and 5 of those 6 underwent CM1 decompression. 2 of those operated resolved their symptoms and were found to have negative post-op tilt exams; 1 resolved her symptoms but remained with a positive tilt exam, and 2 patients did not resolve their symptoms post-op. 5 of the 11 patients with negative tilt exams underwent decompression with resolution of symptoms in 4 of 5; the non-operated patients were treated medically with variable results.
Conclusions: The Chiari drop attack represents a heterogeneous symptom that can present with or without a dysautonomia found on tilt table testing. Though the response to surgical decompression is fair (7/11 patients symptomatically resolved) the relationship of the abnormal tilt table testing to the genesis of the dropping spells or their post-surgical outcome remains unclear.

7. **Symptomatology of Chiari Malformation Type 1 in Patients Under Age 5**
Malini Narayanan, MD, MS; David Frim, MD, PhD (Chicago, IL)
Introduction: Symptomatology of Chiari malformation type 1 (CM1), such as headache, swallowing difficulties, or cranial neuropathies, can present in any age group. Very little, however, has been recently written about the presentation of Chiari syndrome in the very young child.
Methods: Records of 20 consecutive patients less than five years presenting for treatment of CM1 over an 8-year period were reviewed. Presenting symptoms, operative course, and clinical outcome were recorded.
Results: 7/20 patients (35%) presented with behavior suggestive of headache (head banging, violent outbursts); these behaviors improved all patients postoperatively. 8/20 (40%) patients presented with preoperative speech deficits (delay, 6/8; dysarthria, 2/8); 7 improved postoperatively. 7/20 (35%) had an associated syrinx which was obliterated or reduced in size postoperatively in all but 1 of the patients. 4/20 had swallowing difficulties with regurgitation; all exhibited some improvement postoperatively. There was one persistent CSF leak due to CSF pressures in excess of 30 cm of water requiring lumboperitoneal shunting. Symptoms recurred after a period of improvement in 2 patients; CSF pressures in excess of 27 cm of water were found and both underwent shunting. 17/20 (85%) patients had significant or complete reduction in symptoms after one year. Shunting ?!!
Conclusion: Young children present for Chiari surgery with both classic symptoms (headache equivalent) and other symptoms (speech delay) less typical in older children and adults. Despite non-classic symptoms, the outcome of these very young children was generally good. Interestingly, 3 of 20 (15%) had symptom recurrence and required CSF shunting for elevated CSF pressures of unknown origin.

8. **Autologous Duraplasty in Chiari Type I Malformation**
Caitlin E. Hoffman, BA; Isamah T. Nneka; Mark M. Souweidane, MD (New York, NY)
Introduction: Controversy surrounds the surgical treatment for the Chiari Type I malformation (CM-I). Osseous decompression alone without duraplasty has been advocated as a safe alternative in the treatment of CM-I because of purported morbidity associated with dural opening. Precise rates of surgical morbidity however have been elusive due to the variable methods employed once durotomy has been performed. The current study is undertaken to accurately measure the morbidity associated with a standardized surgical technique encompassing osseous decompression with autologous duraplasty.
Methods: Thirty-five patients undergoing decompression with autologous duraplasty for the treatment of CM-I served as the basis for a retrospective chart review.
Results: The mean age at the time of treatment was 13.6 years. Preoperatively nineteen (54%) patients had a syrinx (17) or presyrinx state (2). Follow-up ranged from 3 to101 months (Mean = 16months). There was no surgical mortality and no patient exhibited neurologic worsening. There were no cases of postoperative meningitis (aseptic or bacterial), CSF leak, or hydrocephalus. One patient (3%) was treated for a postoperative pseudomeningocele with percutaneous tap and observation. Clinical improvement was complete or partial in 91% (32/35) while 9% (3/35) had no improvement. Two patients required a syringosubarachnoid shunt for persistent syringomyelia.
Conclusions: The morbidity attributed to dural opening with autologous duraplasty as part of the surgical correction of CM1 is negligible and probably overestimated. This information should be considered in the selection of treatment options, particularly as it relates to alternative surgical procedures that avoid dural opening.

9. **Intraoperative Neurophysiological Monitoring in Patients Undergoing Tethered Cord Surgery after Fetal Myelomeningocele Repair**
Eric M. Jackson, MD; Daniel M. Schwartz, PhD; N. Scott Adzick, MD; Mark P. Johnson, MD; Leslie N. Sutton, MD (Philadelphia, PA)
Introduction: Despite the theoretical advantage of decreased exposure to neurotoxic amniotic fluid, there is controversy regarding the effects of fetal myelomeningocele repair on lower extremity function. We investigated neural function in patients after fetal myelomeningocele repair using intraoperative neurophysiological monitoring in a subset of patients who returned for tethered cord surgery.
Methods: Data was retrospectively reviewed on five patients who underwent fetal repair of their myelomeningocele and returned to our institution for untethering (2) or

removal of an epidermoid or dermoid cyst (3). Office records were reviewed to identify the anatomic level of the myelomeningocele and the functional status of each patient. Spontaneous and stimulated electromyography recordings and transcranial electric motor evoked potentials (tceMEP) from surgery were reviewed to assess the functional integrity of the nerve roots and spinal cord.
Results: Anatomic levels are as follows: L2 (1), L2-3 (1), L4 (2), L4-5 (1). All patients are ambulatory, with one (L2) requiring braces and a walker. Two patients (L2 and L2-3) require intermittent catheterization. During re-exploration, all patients had appropriate reproducible signals below their anatomic level on electromyography and tceMEP.
Conclusions: In comparison to 27 of 189 post-natally treated patients from a prior review, all five of these patients have lower extremity function below their anatomic level, suggesting that neurological status improves with fetal repair. Although our conclusions are limited by the absence of matched control data, we believe these patients provide direct evidence of functionality and conductivity of the spinal cord and nerve roots below the anatomic level of the myelomeningocele after fetal repair.

10. **The Chiari I Malformation in the Very Young Pediatric Population**
Arnold H. Menezes, MD; Kathleen A. Donovan, ARNP, MSN (Iowa City, IA)
Introduction: The clinical presentation in the very young child with Chiari I malformation is often distinct. This can often lead to delay in diagnosis and unnecessary procedures. A retrospective analysis of this population was done to highlight this unique presentation.
Methods: 58 children with Chiari malformation less than age 6 were identified. All of the patients underwent surgical treatment. Records were reviewed for presenting symptoms, signs, treatment and outcome.
Results: At presentation 33 of the patients were below age 3 and 25 were between ages 3 and 6. 11 children had undergone previous surgery for Chiari malformation, 6 children previous fundoplication or gastrostomy for severe GERRD, and 2 had tracheostomies. Oropharyngeal dysfunction (reflux, emesis, failure to thrive, dysphagia) was found in 72% below age 3 and in 13% between ages 3 and 6. Scoliosis was predominant in the older age group (56%), but was present in only 11% less than 3 years. Syringohydromyelia occurred in 92% of the children ages 3 to 6 and 18% below age 3. Headaches were the main presentation in 33% of children less than 3 and 56% of older children. Symptoms resolved completely in 53% of patients and improved in an additional 37%. 6 of the patients required re-operation and were found to have scarring and/or new bone formation.
Conclusions: The results of this study show that oropharyngeal dysfunction is a common presentation in children below age 3. Headaches and syringomyelia with scoliosis are more prevalent in 3 to 6 year olds.

11. **Operative Complications, Fusion Rate and Neurologic Outcome After Surgical Stabilization of Thoracolumbar Fractures in Children**
James M. Johnston, MD; Neill Wright, MD; Matthew Smyth, MD; Tae Sung Park, MD; Jeff Leonard, MD (St. Louis, MO)
Introduction: Review of the literature shows few reports of outcomes associated with surgical treatment of unstable thoracolumbar fractures in the pediatric population. We present a brief review of the literature as well as our recent experience at Saint Louis Children's and Barnes-Jewish Hospitals.
Methods: This was a retrospective review of 27 consecutive thoracolumbar fusions after trauma performed at our institutions between 2001-2005. Information was gathered from hospital and clinic charts regarding age at time of surgery, sex, mechanism of injury, fracture type and characteristics, initial neurologic deficit, procedure, operative complications and final neurologic outcome.
Results: There were 10 females and 17 males evaluated in this study, with an average age at surgery of 14.7 years (range 4.6-20.9). Fracture types included eleven burst (40.7%), 8 fracture/dislocations (29.6%), 6 Chance-type fractures (22.2%), one bilateral pars fracture (3.7%) and one diffuse multilevel crush injury (3.7%). Fourteen (51.9%) patients presented neurologically intact, five (18.5%) had incomplete spinal injuries and eight (29.6%) had complete spinal cord injury. Twenty children underwent posterior fusion, five underwent anterior corpectomy with fusion and two underwent combined anterior/posterior fusion. There were no cases of neurologic deterioration following stabilization, and one adolescent with initial paraplegia regained ambulatory status at long term follow-up (12.5%). There was one case (3.7%) of postoperative wound infection requiring surgical washout and debridement, and no children required repeat fusion surgery for progressive kyphosis or instability.
Conclusion: Thoracolumbar fusion after trauma appears to be well tolerated in the pediatric population, with no cases of neurologic deterioration or pseudarthrosis reported in this series.

12. **Surgical Management of Atlanto-axial Instability in Children**
John Thorne, MD; Likhith Alakandy, FRCS; Richard Cowie, FRCS (Manchester, United Kingdom)
Introduction: The aim of the study was to evaluate the outcome of surgical stabilization in children with craniocervical instability.
Methods: A 15-year retrospective review of 47 children (24 age range 2-18, median 8 years) who underwent surgery for atlanto-axial instability.
Results: Thirty-four patients had instability secondary to mucopolysaccharidosis (MPS) (23 had Morquio's disease (MPS IV), 4 Maroteaux-Lamy Syndrome (MPS VI), 5 Hurler's disease (MPS I) and 2 Hunter's disease (MPS II)). Other causes included trauma (n=3), Down's syndrome (n=3), os odontoideum (n=2), juvenile idiopathic arthritis, congenital odontoid hypoplasia, tumor, epiphyseo-metaphysial dysplasia and rotatory C1/2 subluxation. Occipitocervical fusion was performed in 34 patients. The others had C1/2 fusion. Occipital skull bone graft was used in all but 9 cases where iliac crest grafts were taken. The shape of the calvarial graft provided the necessary contour at the craniocervical junction. This was secured in place using metal wires or nylon sutures. The cervical spine was routinely immobilized in a halo jacket for 4 months following surgery. Of the patients with available data, 37/43 achieved solid bony fusion with good alignment at a mean follow-up of 30 months (range 6-120 months). In 5 patients the fusion was incomplete but given clinical improvement and the absence of significant instability they are being treated conservatively. One required revision surgery.
Conclusions: The effectiveness of surgical stabilization and fusion of craniovertebral junction instability due to a wide range of pathology is demonstrated. Occipital calvarial skull appears to be the ideal choice of bone graft.

13. **Selection of Rigid Internal Fixation Construct for Stabilization at the Craniovertebral Junction in Pediatric Patients**
Richard C. E. Anderson, MD (New York, NY); Brian T. Ragel, MD (Salt Lake City, UT); J. Mocco, MD (New York, NY); Leif-Erik Bohman, BA (New York, NY); Douglas L. Brockmeyer, MD (Salt Lake City, UT)
Introduction: Pediatric atlantoaxial and occipital-cervical instability has traditionally been treated with posterior wiring and external halo orthoses. Recently, successful outcomes have been achieved with C1-C2 transarticular screws. Placement of transarticular screws is not always possible, however, and alternative means of rigid internal fixation must be sought. This report describes algorithms by which atlantoaxial and occipital-cervical fixation may be evaluated for use in complex anatomical circumstances.
Methods: Records of children undergoing either atlantoaxial or occipital-cervical fixation (OCF) with rigid internal fixation over an 11-year period were retrospectively reviewed. Postoperative fusion was documented with either CT scans or plain radiographs.
Results: Among the 89 patients who underwent atlantoaxial fixation or OCF, the craniocervical anatomy of 19 (21%) patients (15 OCF and 4 atlantoaxial fixation) required alternative methods of internal fixation (e.g., not bilateral C1-C2 transarticular screws). Types of screw fixation included loop or rod constructs anchored by combinations of C1-C2 transarticular screws (n=11), C1 lateral mass screws (n=10), C2 pars screws (n=18), C2 translaminar screws (n=1), and subaxial lateral mass screws (n=6). Mean age of the patients (12 boys, 7 girls) was 10.2 years (1.3-17 years). Mean follow-up was 1.4 years (0.1-8.3 years). All 16 patients with greater than 3-month follow up achieved bony fusion and maintained stable constructs on radiographic studies. Clinical improvement was seen in all patients who had preoperative symptoms.
Conclusions: Novel algorithms to help guide selection of rigid internal fixation constructs when performing pediatric C1-C2 and occipital-cervical stabilization are described. Use of these algorithms has led to successful stabilization in 89 pediatric patients.

14. **Occipitocervical Instrumentation in the Pediatric Population using the ABT Loop System: Initial Results and Long-term Follow-up**
Daniel E. Couture (Salt Lake City, UT); Nathan Avery, MD (Flagstaff, AZ); Douglas L. Brockmeyer, MD (Salt Lake City, UT)
Introduction: Rigid occipitocervical fixation in pediatric patients is gaining widespread acceptance. However, most of the instrumentation has been modified from adult-sized hardware. The Avery-Brockmeyer-Thiokol Loop System (ABT loop system, Medtronic Corporation) is a rigid occipitocervical fixation device designed specifically for children. It fixates to the occiput and incorporates either C1-2 transarticular screws or C2 pars screws. It is preformed, available in a variety of sizes, and is easy to use. We describe our clinical experience and long-term follow-up with the first 20 patients.
Methods: Retrospective review of medical records and radiographic imaging was performed for patients undergoing occipitocervical fusion with the ABT loop.
Results: Twenty patients have undergone occipitocervical fusion with the ABT loop system. The mean age was 4.9 years (1.3-12) and mean follow-up was 2 years (.25-5). Five patients had post-traumatic instability and 15 patients had congenital instability. Eleven patients underwent bilateral C1-2 transarticular screw placement and nine patients had a combination of transarticular screw and pars screw placement. Only one patient required halo orthosis; the rest were managed with hard collar. All patients had radiographic evidence of solid occipitocervical arthrodesis on last follow-up.
Conclusions: The ABT loop system is a novel internal fixation device for children with post-traumatic or congenital occipitocervical instability. It comes in a variety of preformed sizes and is easy to use. Successful arthrodesis was achieved in 100% of the population with minimal use of halo orthosis.

15. **Screw Fixation of the Upper Cervical Spine in The Pediatric Population**
David J. Sacco, MD; Bradley Weprin, MD; Frederick Sklar, MD; Dale Swift, MD; Angela Price, MD (Dallas, TX)
Introduction: Instability of the upper cervical spine and craniocervical junction is common in the pediatric population. We present our experience with fusion of the upper cervical spine and craniocervical junction involving screw fixation of the C1 lateral mass and/or the C2 pars interarticularis or spinous process. We have found this to be a technically straightforward and useful technique for a variety of pathologies in the pediatric population.

Methods: Twelve patients underwent upper cervical spine fusion using rigid internal fixation. The age range was 3 - 17 (mean 10). Pathology included os odontoidium (5), Down's syndrome (2), congenital occipital cervical instability (2), iatrogenic (postoperative) C1/C2 instability (2), and penetrating trauma (1). C1/C2 fusion with C1 lateral mass and C2 pars interarticularis screws were used in 7 patients. A combination of C1 or C2 screw fixation techniques was used in the remaining five.
Results: Twelve patients have had successful fusions documented by stability in flexion and extension. Screws could be place bilaterally in all patients using lateral fluoroscopy and intraoperative landmarks. Image guidance was not used. There were no vascular or infectious complications. There has been no hardware failure.
Conclusions: Occipital-cervical and C1/C2 instability is common in the pediatric population. Screw fixation of the upper cervical spine in children is a useful and technically straightforward undertaking. These techniques can be adopted for a variety of causes of upper cervical and occipital-cervical instability and can serve as a viable alternative to transarticular screw fixation. Screw fixation can be used even in young children with good results.

16. **Spinal Stenosis in Pediatric Achondroplasia**
Daniel M. Sciubba, MD; Neena I. Marupudi, MS; Marcus J. Bookland, MD; Carlos A. Bagley, MD; Joseph C. Noggle; Michael C. Ain, MD; Benjamin S. Carson, MD; George I. Jallo, MD (Baltimore, MD)
Introduction: Achondroplasia is a hereditary form of dwarfism caused by a defect in endochondral bone formation causing skeletal abnormalities including short stature, shortened limb bones, macrocephaly, and small vertebral bodies. In the pediatric population, symptomatic spinal stenosis occurs at all spinal levels due to the abnormally narrow bony canal. In this study, clinical outcomes in children with achondroplasia following spinal canal decompression were assessed.
Methods: A retrospective review was conducted involving pediatric patients with heterozygous achondroplasia and symptomatic stenosis following decompressive procedures at the authors' institution over a nine-year period. Measured outcomes included: resolution of symptoms, need for repeat surgery, presence of fusion, follow-up period, and complications.
Results: Forty-four pediatric patients underwent fifty-one decompressive procedures, 38 thoraco-lumbar (74.5%), 9 lumbar (17.5%), 2 cervico-thoracic (4%), one cervical (2%), and one thoracic (2%). Average age at surgery was 12.4 years (5-21 years). Forty patients underwent fusion procedures (78.4%). Complete resolution or partial improvement occurred in all patients. Average follow-up was 18 months. During follow up, 6 patients (13.6%) required an additional procedure for recurrence of symptoms or progressive kyphosis. Two post-operative infections occurred, treated successfully with intravenous antibiotics and local wound care. Cerebrospinal fluid (CSF) leak occurred in seven patients (13.7%), treated successfully with CSF diversion or wound over sewing. No deaths occurred.
Conclusion: Decompression of the spinal canal in pediatric achondroplasia patients may be accomplished safely with significant clinical benefit. Re-operations for recurrence of symptoms or kyphotic deformity were all in the thoraco-lumbar spine, an area associated with significant post-operative kyphosis in pediatric achondroplasia patients.

17. **Our Recent Experience with Primary Cranial Vault Encephaloceles: 44 Cases**
Cuong Bui, MD; Richard S. Tubbs, PhD, PA-C; Elise P. Salerno, MS; Blake Pearson, MD; Leslie J. Acakpo-Satchivi, MD, PhD (Birmingham, AL); John C. Wellons, III, MD; Jefferey B. Blount, MD; Walter J. Oakes, MD (Birmingham, AL)
Introduction: Primary encephalocele is a relatively common pathology in pediatric

neurosurgery. As an effort to better understand the many nuances of this disease and its treatment paradigm, we reviewed our last 15 years of surgical experience with primary encephaloceles in infants.

Methods: We retrospectively reviewed 44 cases of congenital cranial vault encephaloceles treated at Children's Hospital of Alabama during the last 15 years.

Results: All repairs were within the two years of life, with 91% within the first week. There were no deaths and 2 cases csf leakage. The cohort was stratified by location: 30/44 (68%) were occipital and 14/44 (32%) were located frontally. 53% of the patients with occipital encephaloceles went on to require CSF shunting compared to 14% of the anterior group. Although the literature reports a significantly higher female predominance for patients with occipital encephaloceles, we found only 53% of our occipital encephaloceles to be female. Interestingly, we found a concomitant middle fossa arachnoid cyst in 11% of our cohort. There has been no report of such association in the literature. With an average of 8 years follow-up, outcome analysis found that more than 50% of the occipital encephalocele group have developmental delays and will be unable to live independently as adults due to cognitive and/or physical difficulties.

Conclusions: Our data generally conforms to some of the established data on the subject but novel findings appeared to be present: relatively equal sexual distribution for occipital encephaloceles, a relatively high rate of 11% concomitant arachnoid cysts, and outcome analysis in terms of independent living.

18. **Evaluation of MRI-based Measurement of ICP in Pediatric Patients: Early Results**

Noam Alperin, PhD; Joy Ito, RN; Tadanori Tomita, MD; John Curran, MD; Roberta Glick, MD (Chicago, IL)

Introduction: The goal of this pilot study is to compare MRI-derived values of ICP (MR-ICP) with invasively measured ICP in pediatric patients.

Methods: IRB approval was for up to 10 patients. MR-ICP is derived from two velocity-encoded scans, one with high velocity encoding of 80 cm/sec for imaging arterial inflow and venous outflow and a second scan with velocity encoding of 7 cm/sec for imaging CSF flow between the cranium and the spinal canal. The details have been described previously. Two patients, a 2 month old and 16 year old females were studied following tumor resection.

Results: The following measurements were obtained in the 2 month old baby: total cerebral blood flow (tCBF) 126 mL/min, CSF flow volume between the cranium and the spinal canal 4 mL/min or 0.03 cc per cardiac cycle, and MR-ICP 3.8 cm H2O. Invasive ICP values after the scan were from 4-7 cmH2O. Results from the second patient were: tCBF 635 mL/min, oscillatory cranio-spinal CSF flow 0.55 cc/cycle, and MR-ICP 41 cmH2O. This patient's EVD was clamped during the scan and an ICP greater than 33 cmH2O was measured following the scan. Following CSF drainage ICP returned to 20cmH2O.

Conclusion: Results from the two patients demonstrated good agreement between invasive and MR-based ICP over a wide range. The lower ICP value measured invasively in the second patient can be explained by drainage of small amounts of CSF into the water column manometer. These promising preliminary results warranted further evaluation of the technique in a larger number of patients.

19. **The Application of Electromagnetic Image Guidance Technology in Paediatric Neurosurgery**

Caroline S. Hayhurst, MD; Neil Buxton, MD; Paul L. May, MD; Conor L. Mallucci, MD (Liverpool, United Kingdom)

Introduction: Frameless, pinless neuronavigation systems allow the application of image guided surgery to a broader population of patients, particularly in children where cranial fixation is undesirable. In addition, electromagnetic spatial localization eliminates the need for a direct line of site allowing the tips of instruments to be tracked at depth in real time. We present our experience with electromagnetic technology to highlight the advantages in the paediatric age group.

Methods: To date we have performed 70 cases using electromagnetic navigation in both adults and children. Rigid and non-invasive scalp applied reference frames have been used. This series includes image guided endoscopy and ventricular access procedures, such as ventricular catheter placement into slit ventricles, catheter placement for idiopathic intracranial hypertension, EVD placement in traumatic brain injury and ommaya placement for CNS leukaemia.

Results: In addition to the traditional indications for image guided surgery, electromagnetic neuronavigation has proved valuable for complex endoscopies and placement of ventricular catheters into undersize ventricles. All ventricles have been cannulated on the first pass and no patient undergoing image guided catheter placement has to date needed revision of the proximal catheter.

Conclusions: Electromagnetic technology avoids the problems of line of sight and the need for rigid head fixation seen with most other digital spatial localizing systems. This facilitates the application of image guided surgery to a wider series of cases, in particular endoscopy and ventricular catheter placement. The introduction of non-invasive localizers facilitates use in all shunt surgery, avoiding sub-optimal ventricular catheter placement and subsequent shunt malfunction.

20. **Pallidal Deep Brain Stimulation for Dystonia in Pediatric Patients**

Ron L. Alterman, MD; Joan Miravite, FNP (New York, NY); Jay Shils, PhD (Boston, MA); Donald Weisz, PhD; Michele Tagliati, MD, DDS (New York, NY)

Introduction: Deep brain stimulation (DBS) at the internal globus pallidus (GPi) has become the treatment of choice for medically refractory primary generalized dystonia (PGD). Few studies have focused on the outcome of DBS surgery specifically in the pediatric population. We now report our results in 15 consecutive pediatric patients who underwent GPi DBS for PGD.

Methods: Retrospective analysis of the office charts of the treating physicians (RLA, MT). The Burke-Fahn-Marsden Dystonia Rating Scale (BFMDRS), served as the primary clinical outcome measure.

Results: The median age at the time of surgery was 14 years (range: 7-22 years) and the median symptom duration was 5 years (range: 2-11 years). Ten of the patients are male. Fourteen possess the DYT1 gene mutation. The mean follow-up period is 78 + 59 weeks. Thirteen of the 15 patients have been followed for at least one year. Surgical complications were limited to two infections, which were successfully treated with device removal, intravenous antibiotics, and device re-implantation. One year after surgery, the median improvement in the BFMDRS motor score was 84% (range: 50-100%; P= 0.001, Wilcoxon Rank Sums Test). The disability score was improved at median of 75% (range: 33-100%; P= 0.001). Patients improved steadily over the first 12-24 months. The first two patients, who have been followed for four years, have maintained their response.

Conclusions: Pallidal DBS is a safe and highly effective intervention in the pediatric patients with PGD. Profound improvements in motor function are observed over the course of 1-2 years and appear to be maintained long-term.

21. **Surgical Treatment of Spasticity in Children: Comparison of Selective Dorsal Rhizotomy and Intrathecal Baclofen Pump Implantation**

Peter Kan, MD; John Kestle, MD; Marion Walker, MD; Judith Gooch, MD (Salt Lake City, UT)

Introduction: The neurosurgical treatments for spasticity in children include selective dorsal rhizotomy (SDR) and intrathecal baclofen pumps (ITBPs). Selective dorsal rhizotomy has been the traditional approach while ITBPs have been widely used in the past decade as an attractive alternative. The purpose of the study was to examine and compare the outcomes of these two procedures in the treatment of children with moderate to severe spasticity.

Methods: A consecutive series of 71 children who underwent SDR for spasticity was compared to a group of 71 children matched by age and preoperative Gross Motor Function Measure (GMFM) who underwent ITBP placement. Change in GMFM, lower extremity tone (based on the Modified Ashworth-Bohannon Scale), and lower extremity passive range of movement (PROM) at one year as well as the need for subsequent orthopedic procedures and parents' satisfaction were selected as outcome measures.

Results: At one year, both SDR and ITBP decreased tone, increased PROM, and improved function. Both procedures resulted in a high degree of patient satisfaction. The proportion of patients requiring subsequent orthopedic procedures were 19.1% and 40.8% in the SDR and ITBP group respectively. Compared to ITBP, SDR provided a larger magnitude of improvement in tone (p=0.0000), PROM (p=0.0138), and gross motor function (p=0.0000). Fewer patients in the SDR required subsequent orthopedic procedures (p=0.0106).

Conclusions: For children with moderate to severe spasticity, both SDR and ITBP are effective surgical treatments. Based on our results, SDR is more effective in reducing the degree of spasticity and improving function compared to ITBP in this group of patients.

22. **CT/MRI Fusion for Neuronavigation in Subdural Grid Based Epilepsy Surgery: Technical Note**

James M. Johnston, MD; Matthew Smyth, MD (St. Louis, MO)

Introduction: Grid-based epilepsy surgery provides high resolution localization of epileptogenic activity near eloquent cortex. Unfortunately, the metallic artifact introduced by the electrode array precludes the use of frameless magnetic resonance neuronavigation in second stage resection. We present a simple technique that allows magnetic resonance image-guided navigation to be utilized during the second stage.

Methods: Routine 2 mm Stealth sequence magnetic resonance images were acquired prior to first stage subdural grid placement. Electrocorticography and cortical mapping data were acquired per usual routine, and prior to second stage cortical resection 1 mm Stealth sequence computed tomography images were acquired. Medtronic Stealth Treon Cranial 4 software was used to fuse both studies. A three dimensional model of the electrode array was reconstructed and superimposed on preoperative magnetic resonance images. Specific active regions of the grid were highlighted and correlated with underlying cortical anatomy for both preoperative planning and intraoperative guidance.

Results: Between August 2005 and July 2006, 9 patients (4 boys and 5 girls, age range 6.6 to 22 years) underwent two-stage epilepsy procedures using this fusion technique. Neuronavigation was found to be helpful in all resections, during which cortex subjacent to epileptogenic electrodes was resected with MRI guidance. There was no significant time penalty or morbidity in the series.

Conclusions: We found this technique particularly useful in resections involving extensive cortical dysplasias where intraoperatively "normal" gyral anatomy did not correlate with obvious magnetic resonance imaging abnormality. This technique enables intraoperative correlation between electrographic data and image-guided identification of abnormal cortex.

23. **Epilepsy Surgery Outcome in 83 Pediatric Patients - The Children's Hospital of Wisconsin Experience**

Sean M. Lew, MD; Mary L. Zupanc, MD; Rhonda Roell-Werner, RN; Michael J. Schwabe, MD; Wade Mueller, MD (Milwaukee, WI)

Introduction: We review outcome data from a consecutive series of 83 pediatric patients treated with cranial epilepsy surgery over 3-year period at a single institution.

Methods: A retrospective analysis was performed, reviewing 83 consecutive pediatric patients who underwent cranial epilepsy surgery at the Children's Hospital of Wisconsin between 2002-2005. Data was collected via chart review and post-operative questionnaires.

Results: The seizure outcomes for all surgery types were as follows (Engel classification): Class I - 68.7%; Class II - 12%; Class III - 19.3%; Class IV - 0%. If corpus callosotomies were excluded, the percentage of patients achieving a Class I outcome was 72%. Results were best with temporal lobectomies (Class I - 84.2%), and hemispherectomies (Class I - 76%). Seizure freedom was more common with older patients: adolescents - 78.4%; young children - 68%; infants - 50%. Cortical dysplasia was associated with a less favorable seizure outcome. Quality of life measures correlated strongly with seizure outcome. Measures of physical activity, cognition, social activity, and general health were significantly better in children who were seizure free postoperatively.

Conclusion: Epilepsy surgery in medically refractory epilepsy pediatric patients significantly improves seizure control and quality of life.

24. **Management of Vagal Nerve Stimulator Infections - Do They Need to be Removed?**

Rachana Tyagi, MD; Yashar M. Ghomri, BS; Andrew W. Grande, MD; Bradford Curt, MD; Kerry R. Crone, MD; Francesco T. Mangano, DO (Cincinnati, OH)

Introduction: Vagal Nerve Stimulators (VNS) have been used successfully to treat medically refractory epilepsy. While their efficacy is well established, the management of infections is less clearly defined. In our experience, patients who have experienced a benefit have been reluctant to have their devices removed. We therefore sought conservative management options to salvage infected VNS.

Methods: A retrospective review of 174 (88 female/86 male) consecutive pediatric patients prospectively gathered from 2000 to 2006.

Results: We identified 10 (5.7%) infections in 174 patients. In 9/10 patients the cultured organism was a pan-sensitive Staphylococcus aureus. Ultimately, 8/10 patients required device removal. Five of 10 (50%) patients underwent early removal (within 1 month). The remaining 5 patients were initially treated without removing the VNS. Two of five (40%) patients were successfully treated with antibiotics only. Patients who failed conservative management were given Cephalexin as first line antibiotic treatment. All patients completely recovered after treatment.

Conclusions: Vagal nerve stimulators can be placed with low infection rates (5.7%). Treatment without removal is a viable option (2/10), however, our data suggests that oral cephalosporin may not be best first line therapy. Patients who were treated either medically and/or surgically had no further complications in their clinical course and completely recovered.

25. **Electrophysiological Analysis Comparing Epileptogenic Human Cortex and Hyperexcited Rat Cortex**
Jodi L. Smith, PhD, MD (Indianapolis, IN); Jonathan P. Hobbs, BS (Bloomington, IN); Hema Patel, MD, (Indianapolis, IN); John M. Beggs, PhD (Bloomington, IN)
Introduction: Epilepsy is characterized by highly synchronized paroxysmal bursts of activity within aberrant networks of cortical neurons. A central task in epilepsy research is to elucidate the network-level mechanisms responsible for neuronal hyperexcitability. To address this issue, many investigators have examined electrical activity in slices of rat cortex bathed in culture medium containing high potassium, low magnesium, Bicuculline, and/or Picrotoxin to increase neuronal activity and/or reduce inhibition. However, the following question remains unanswered: how similar is the activity in excited slices of rat cortex to that in epileptogenic human cortex?
Methods: To answer this question, we compared excited slices of rat cortex (n = 10) to a slice of human parietal cortex (n = 1) obtained from the peritumoral epileptogenic zone in a pediatric patient with medically intractable seizures. For each slice, we recorded local field potential activity with a 60-channel microelectrode array for over 1 hr.
Results: Both human and rat cortex slices produced local field potential signals in the form of interictal spikes on almost all electrodes. However, unlike rat cortex, human cortex was spontaneously active in normal cerebrospinal fluid. Moreover, the activity from the human slice showed a high degree of synchrony across electrodes, which was not present in rat cortex.
Conclusions: Although these results are preliminary, they suggest that hyperexcited slices of rat cortex may fail to capture some important features of network activity found in epileptogenic human cortex. Further studies are currently underway to evaluate this hypothesis more completely.

26. **Early Obstacles to Complex Intraventricular Robotic Surgery: Neurosurgical Considerations for the DaVinci Surgical Robot**
Chris S. Karas, MD (Columbus, OH)
Introduction: Recently there has been a significant increase in the indications and applications of robotics within several surgical subspecialties. Most notable are the advances in urologic and general surgery as well as gynecology. In many institutions the Da Vinci robotic surgical system (Intuitive Surgical, Sunnyvale, CA) has become a standard element in the operating room. Thus far there are no intracranial applications for this system, although its current features and instrumentation may provide some distinct advantages to a number of procedures.
Methods: A feasibility trial was undertaken on a cadaveric subject to identify advantages or obstacles to maneuvering within the ventricular system with the currently available Da Vinci robotic technology and instrumentation.
Results: This surgical system allows the operator the ability to move the working portion of the instrument with a high degree of freedom, providing increased maneuverability within the ventricle over the traditional endoscopic approach. Despite this advantage, significant barriers to usability within the brain were identified and will be discussed. Photographic and video documentation were obtained.
Conclusion: Although complex intraventricular robotic surgery is clearly in its infancy, the advantages it may provide are clear and the obstacles not insurmountable. The future of this project in neurosurgery will include inanimate modeling, software revision, and possible novel instrumentation.

27. **Predictors of Shunt Survival After Revision**
Sherise Ferguson, MD; Griffin Meyers, BA; David Rosen, MD; David Frim, MD, PhD (Chicago, IL)
Introduction: Despite recent advances in shunt design, shunt malfunction remains a major complication of hydrocephalus treatment. The objective of this study is to define factors that influence the longevity of previously revised shunts.
Methods: 696 shunt revisions were performed at our institution over an 8-year period. Clinical characteristics of patients undergoing more than 1 revision were identified and examined to determine variables that influence the survival time of revised shunts.
Results: 241 patients underwent 696 shunt revisions. Mean age at revision was 219.2 +/- 217.9 (mean +/- SD) months; mean revision survival was 8.4 +/- 17.2 months. Statistical analysis has thus far revealed the following: shunts revised in hydrocephalus patients lasted longer (10.4 +/- 20.5 months) than in Pseudotumor Cerebri (3.9 +/- 4.6 months; $F = 5.52$; $p < 0.005$); revised lumboperitoneal (LP) shunts have shorter survival times (3.8 +/- 4.2 months) than revised ventriculoperitoneal (VP) shunts (11.8 +/- 22.1 months; $F = 3.94$; $p < 0.05$); revised shunt survival was positively correlated with age at revision ($r = -0.2$; $p = 0.05$; Figure 1); and, shunts revised by complete replacement lasted longer (13.6 +/- 23.2 months) than either proximal (9 +/- 16.5 months) or distal (4.9 +/- 12.6 months) catheter revisions.
Conclusion: CSF shunt failure remains a persistent problem after shunt revision surgery. Predictors of shorter revised shunt survival include age, diagnosis of Pseudotumor Cerebri, use of LP shunts, and sub-total revision. Additional analysis may yet reveal other factors predisposing to limited shunt survival.

28. **Hydrocephalus, Cognition, and Acute Changes in Intracranial Pressure**
Ben Pykkonnen; Scott Hunter, PhD; Eric Larsen, PhD; Maureen Lacy, PhD; Dawn Mottlow, RN, MSN; David Frim, MD, PhD (Chicago, IL)
Introduction: The cognitive effects associated with small acute changes in ICP, such as seen with adjustments of a programmable shunt valve, are unknown. We sought to investigate the presence and nature of acute neurocognitive changes after CSF shunt programmable valve adjustments.
Methods: Subjects underwent neuropsychological testing batteries before and after (using alternate forms) an approximately 5 cm of water pressure adjustment of programmable valves either upwards (n=5) or downwards (n=4). Identical tests were administered to a control group of unadjusted shunted subjects (n=22). Two-way analysis of variance was used to assess for significant differences between groups in cognitive performance between the two tests.
Results: Performance differences were noted on measures of executive functioning: individuals whose ICP was lowered showed decreased function when compared to either controls with unchanged ICP or the group whose ICP was increased. Significant differences were also noted on a measure of basic attention as the raised ICP group showed significant improvements when compared to controls. Surprisingly, a significant increase in depressive symptomatology was noted in individuals whose shunt settings were decreased when compared to controls.
Conclusions: Small, controlled increases or decreases in ICP caused by manipulations of programmable shunt valves can cause measurable changes in cognitive performance. We note that executive function is worsened as ICP is decreased, and attention span is improved as ICP is raised, thus defining two ICP-sensitive cognitive functions. The significance of these observations for shunt pressure manipulations as well as the underlying mechanism of ICP sensitivity of cognitive function remain unclear.

29. **6 Years Experience with Gravitational Valves for Pediatric Hydrocephalus Patients**
Martina Messing-Juenger, MD; Luisa Wilms; Sergey Persits, MD; Hans-Jakob Steiger, MD (Dusseldorf, Germany)
Introduction: Overdrainage is seen after hydrocephalus-shunting. Therefore valves with a gravitational mechanism have been developed. Their opening pressure is dependent on the patient's position.
Methods: To evaluate the course of pediatric hydrocephalus patients with gravitational valves a retrospective study was performed. Three different valves (ShuntAssistant™, PaediGAV™, proGAV™) were investigated.
Results: ShuntAssistant™: Since 2000, 19 children (1-17 yrs) were treated with this additional gravitational valve. 17 had a preexisting adjustable device. All but 1 (PTC) had symptomatic slit ventricles. In all cases over drainage symptoms disappeared. PaediGAV™: Since 2001 68 children between 0 and 15 years (mean 4.5 years) have been operated (74 valves). 39 primary shunt implantations and 29 revisions were performed. Etiologies were post hemorrhagic (20), myelomeningocele (17) post infectious (5) and others. Mean follow-up was 16 months (1-47). Reintervention rate was 25% (healing disorder/infection 7, central dislocation/occlusion 7, under drainage 4, suspected under drainage 2, isolated ventricle 2, over drainage 1). Mean reintervention interval was 4 months. 12 months reintervention-rate was 24%. ProGAV™: 8 patients (2-17 yrs.) received the adjustable valve. Etiologies were post hemorrhagic, syndromal, cystic, post infectious, PTC and chronic untreated HC. No shunt related complications occurred after follow-up of 4-48 months.
Conclusions: Gravitational valves are safe in practice and did not lead to early over drainage. Chronic over drainage can be treated successfully by changing standard valves into gravitational valves or implanting additional gravitational units. Long-term follow-up is necessary to answer the question whether over drainage can finally be avoided after primary implantation of gravitational valves. Ventricular size does not change significantly after secondary implantation of gravitational valves.

30. **Clinical Performance of a Gravity Assisted Valve in a Pediatric Population**
Hannes Haberl, PhD, MD; Paedi-Gav Study Group; Petra V. Berenberg, MD (Berlin, Germany)
Introduction: Current controlled prospective studies comparing different valve designs do not consider gravity-assisted valves. To investigate in a pediatric population the clinical performance of a set of gravity-assisted valves (Paedi-GAV), equipped with defined, position-related resistance features, ranging from 4/14 to 9/29 cmH2O.
Methods: European prospective controlled multicenter study with a follow-up of two years.
Results: Out of 196 patients, recruited by 6 European pediatric centers between 2003 and 2005, 142 have been enrolled in this ongoing study. 70 reached an endpoint either by completing the 2-years follow-up (34) or by valve-explanation (36). 51 patients were lost during follow-up and 21 patients still are under investigation. Preliminary results show a 1-year shunt survival of 76,4 %. Out of 36 valva explanations so far, 9 were related to obstruction,13 to infection and 6 to over drainage. 8 remain undefined. Overdrainage was not related to low resistance devices. Surgical technique was reported to be facilitated by the small and round valve design.
Conclusions: Paedi-GAV seems to meet the expectations towards reliability and surgical handling of a valve in a paediatric population. There remain some open questions concerning the choice of the appropriate resistance-feature. The alternative use of recently developed adjustable components may compensate the present lack of criteria.

31. **Long Term Success Following Shunt Revision by the Percutaneous Endoscopic Recanalization of Catheter (PERC) Technique**
Jogi V. Pattisapu, MD; Christopher A. Gegg, MD; Gregory Olavarria, MD (Orlando, FL)
Introduction: Proximal ventricular catheter obstruction is a frequent occurrence in children with shunted hydrocephalus. In some cases, flow is obstructed due to membranous occlusion by a small amount of tissue. Studies show that only a few of the multiple catheter openings need be patent to maintain adequate shunt function. Recent technological advances have improved our ability to perform intraluminal endoscopic catheter dissection and minimize the morbidity associated with shunt maintenance.
Methods: 87 cases of percutaneous endoscopic shunt recanalization were performed (out of 1335 total shunt revisions) between 2/96 and 12/05 . Mean age was 42 months, and mean follow up period is 21.7 months (6-110 months). Under aseptic conditions in the operating room, the Rickham shunt reservoir was entered, and endoscopic intraluminal dissection using electrocautery was performed to relieve the obstruction. Routine post-operative follow-up was maintained.
Results: 52 cases had a functioning shunt at 6 months, and the longest patent shunt was 110 months. 35 cases required intervention within 6 months, and 12 of these had a repeat PERC procedure (6 were successful, functioning over 6 months). There were no intraoperative complications, and no infections in the PERC cases. One child died at 88 months post-operatively of pulmonary complications. These results compare favorably with published data for shunt revisions.
Conclusion: The percutaneous endoscopic shunt recanalization procedure can be used successfully to treat proximal shunt malfunction.

32. **Predictors of Quality of Life in Children with Hydrocephalus**
Abhaya V. Kulkarni, MD, PhD; Iffat Shams, MD, MPH (Toronto, Ontario, Canada)
Introduction: Children with hydrocephalus face several quality of life (QOL) issues which have been poorly studied in the past. This study was designed to quantitatively identify predictors of long-term QOL in a large sample of children with hydrocephalus, using a reliable and validated outcome measure: the Hydrocephalus Outcome Questionnaire (HOQ).
Methods: All children, aged 5-18 years, with previously treated hydrocephalus and attending the neurosurgery clinic at Sick Kids, Toronto were asked to participate. QOL was measured by the parent-completed HOQ. Several potential predictor variables were extracted from the child's imaging and medical records.
Results: A total of 346 children participated (mean current age: 11.7 years; mean age at diagnosis with hydrocephalus: 21.4 months). Their mean QOL score was 0.68 (on a scale of 0=worst QOL to 1.0=best QOL), but with a wide range (0.19 to 0.99). Using multivariate linear regression analysis, the following predictors were found to be significant predictors of a worse QOL: increased seizure frequency, increased length of hospital stay for initial treatment of hydrocephalus, increased length of hospital stay for treatment of shunt infection, increased number of proximal shunt catheters in situ, and increased distance of the family residence from the pediatric neurosurgical centre.
Conclusions: This is the first study to reliably and validly evaluate QOL in such a large group of children with hydrocephalus. Several important factors appear to predict a worse QOL, but some of these are potentially modifiable and could lead to improvement in the overall outcome for these children.

33. **Interobserver Agreement in Assessing Shunt Failure**
Hugh J.L. Garton, MD; Sandhya Krishnan; Karin M. Muraszko, MD (Ann Arbor, MI)
Introduction: In the evaluation of CSF shunt failure, history and physical examination play an important role. However, the reliability with which specific symptoms and signs are determined by clinicians has received only limited attention in the medical literature. Such data are critical to the clinical decision making and attempts to develop decision rules.
Methods: A convenience sample of 53 children underwent blinded, prospective assessment for CSF shunt failure using a standardized instrument by both attending and resident physician under and IRB approved protocol. The instrument is similar to that used in the Pediatric Shunt Design Trial and accounts for 41 recognized symptoms and signs of shunt failure. It offers either dichotomous or categorical responses depending on the symptom or sign. The collected responses were tabulated and assessed for inter-rater agreement with the kappa and weighed kappa statistics, according to the methods of Fleiss and Cohen.
Results: Of 41 symptoms and signs, 11 occurred with sufficient frequency (>10%) to make inter-rater agreement assessments feasible. Weighed Kappa values suggesting good agreement were noted for the categorical assessment of headaches (k=0.80), nausea (k=0.69), vomiting (k=0.71), irritability (k=0.69), parental report of likelihood of shunt failure (k=0.67) and parental report of fever (k=0.73) as did dichotomous assessment of increased sleepiness (k=0.67). Similarity to prior shunt failure and perception of gait or balance changes had less agreement (k=0.48 &k=0.35). The clinicians agreed as to the rarity of the other assessed symptoms and signs.
Conclusions: Certain common symptoms and signs can be elicited reproducibly by independent observers.

34. **Poor Flow on Ventricular Shunt Tap is Highly Predictive of Proximal Catheter Shunt Malfunction**
Brandon Rocque, MD; Samir Lapsiwala, MD; Bermans J. Iskandar, MD (Madison, WI)
Introduction: The clinical diagnosis of shunt malfunction can be challenging. In this prospective study, we evaluate a common method for interrogating shunts, the shunt tap, and specifically its ability to predict proximal malfunction.
Methods: Under IRB approval, we performed standardized shunt taps on a consecutive series of children with suspected or proven shunt malfunction. Patients who did not need a tap based on clinical grounds underwent a sterile tap in the OR prior to shunt exploration. Those children with no suspicion of malfunction after shunt tap were not taken to the OR and excluded from this study. Data were collected prospectively, and the shunt tap results were analyzed in light of the operative findings.
Results: A shunt tap was obtained prior to 68 surgical shunt revisions in 50 children. Of the 68 taps, 27 had no flow or poor CSF flow on aspiration. Twenty-six of these had intraoperative confirmation of proximal catheter obstruction. Of 41 taps with CSF return that is spontaneous or requiring gentle aspiration (many of whom had elevated ICP), 22 had no sign of proximal catheter obstruction intraoperatively. The positive predictive value of poor flow on shunt tap was 96%, while good flow on shunt tap predicted adequate proximal catheter function in 54% of cases.
Conclusion: Poor flow of CSF on shunt tap is highly predictive of obstruction of the proximal catheter. Since not all patients with good CSF return were taken to the OR, the specificity of this test cannot be determined from our study.

35. **Effects of Different CSF Obstruction Sites in Experimental Communicating Hydrocephalus**
James P. McAllister, PhD; Jie Li, MD, MBA; Joel Parraghi; Janet M. Miller, PhD; Yimin Shen, PhD (Detroit, MI); Michael R. Egnor, MD; Mark E. Wagshul, PhD (Stony Brook, NY); E. Mark Haacke, PhD (Detroit, MI); Curt Stewart, MP, MS (Carefree, AZ); Marion E. Walker, MD (Salt Lake City, UT); Steven D. Ham, DO (Detroit, MI)
Introduction: This study aimed to compare histopathology and motor behavior in two models of experimental communicating hydrocephalus.
Methods: Basal cistern obstruction (BC) was achieved by injecting kaolin into the subarachnoid space (SAS) after anterior exposure of the C1-clivus interval. The cortical SAS (CTX) was blocked by injections of kaolin via bilateral craniotomies and blunt separation of the SAS partitions. Intact and saline-injected animals served as controls. Pre-trained animals underwent motor testing (parallel bar, ladder climb, rope climb, foot faults on a grid walk) at weekly intervals post-injection. Histological sections were quantitatively analyzed for cytoarchitectural changes, astrocytosis, microgliosis, neuron death, and axonal degeneration.
Results: MRI revealed that ventriculomegaly progressed rapidly (2-14 days post-kaolin; mean Evan's ratio 0.43) after BC obstruction, but very slowly (3-4 months, mean Evan's ratio 0.39) after CTX blockage. In the periventricular white matter, reactive astrocytosis and microgliosis were prominent, but only after basal cistern injections; quantitative data suggested that these reactions diminished over time and depended on the severity of ventriculomegaly. No neuron cell body degeneration occurred in either injection group and only mild axonal degeneration was present in the periventricular white matter after basal cistern obstruction. Preliminary data indicate that BC animals exhibited significant ($p<0.05$) motor deficits compared to intact animals; similar trends occurred compared to saline-injected controls, but the surgical effects of induction limited statistical significance.
Conclusions: These results suggest that communicating hydrocephalus develops quite differently depending on the site of SAS blockage, and that reactive gliosis correlates with motor deficits, at least initially.

36. **Priorities for Hydrocephalus Research: Report from the NIH-sponsored Workshop "Hydrocephalus: Myths, New Facts, Future Directions"**
James P. McAllister, PhD (Detroit, MI); Michael A. Williams, MD (Baltimore, MD); Marion L. Walker, MD (Salt Lake City, UT); Dory Kranz, BS (San Francisco, CA); Lolli Fleming, BS (West Roxbury, MA); Marvin Bergsneider, MD (Los Angeles, CA); Marc R. Del Bigio, MD, PhD (Winnepeg, MB, Canada); David M. Frim, MD (Chicago, IL); John R.W. Kestle, MD (Salt Lake City, UT); Mark G. Luciano, MD, PhD (Cleveland, OH); Joseph R. Madsen, MD (Boston, MA)
Introduction: An NIH workshop entitled "Hydrocephalus: Myths, New Facts and Clear Directions" from September 29 to October 1, 2005 in Bethesda, Maryland brought together an international group of experts in pediatric and adult hydrocephalus, and scientists working in related fields to clarify the issues facing hydrocephalus research and identify critical advances necessary to improve outcomes for patients with hydrocephalus.
Methods: Plenary and breakout sessions covered injury and recovery mechanisms, modeling, biomechanics, diagnosis, current treatment and outcomes, complications, quality of life, future treatments, medical devices, development of research networks and information sharing, and education and career development.
Results: The major findings were: (1) the current methods of diagnosis, treatment, and outcomes monitoring are not satisfactory; (2) outcomes are not satisfactory due to frequent complications, poor rate of shunt survival, and poor quality of life for patients; (3) inadequate methods exist for monitoring neurocognitive function and control of CSF variables, such as pressure, flow or pulsatility; (4) novel interdisciplinary research approaches, including other investigative fields such as glaucoma, are needed; (5) the pathophysiology and recovery mechanisms of neuronal function in hydrocephalus are poorly understood; (6) basic, clinical and translational hydrocephalus and CSF physiology research is severely under-funded; (6) training programs in both basic and clinical research should be organized and supported.
Conclusions: A consensus document that summarizes the workshop proceedings and provides suggestions for future research endeavors and support has been submitted for publication. This NIH workshop and the resulting consensus document ('white paper') are significant events in promoting hydrocephalus research.

38. **The Belfast Experience Using Optic Nerve Sheath Ultrasound in the Assessment of Pediatric Hydrocephalus**
David McAuley, FRCS; Anne Paterson; Louise Sweeney (Belfast, United Kingdom)
Introduction: Optic nerve sheath diameter has been linked with intracranial pressure in previous studies. Measurement of sheath diameter using transorbital ultrasound is proposed as a clinical assessment indicator of developing hydrocephalus in the paediatric neurosurgical population.
Methods: A retrospective review of optic nerve sheath ultrasound examinations performed in a clinical setting between 2001-2006 for assessment of hydrocephalus in a single institution.
Results: A total of 321 examinations were performed in 157 patients over the study period. A satisfactory image was possible in all cases. Sheath diameters were correlated with clinical case data from concurrent case records.
Conclusions: Transorbital Ultrasound is a reproducible, non-invasive technique for the assessment of optic nerve sheath diameter and is well tolerated in children. Our series revealed asymptomatic baseline value higher than previous reports. Variation from individual case asymptomatic baseline was the most sensitive variable in the series in determining development of hydrocephalus. This technique is felt to be a useful adjunct in the assessment of hydrocephalus in the paediatric neurosurgical population.

39. **Outcome Analysis of Shunt Valve Pressure Relative to Shunt Malfunction in Children**
Holly Gilmer-Hill, MD; Mohammad S. Shukairy, MD; Chaim Colen, MD, PhD; Tiffany Sakleh, PA-C; James P. McAllister, PhD; Sandeep Sood, MD; Steven Ham, MD (Detroit, MI)
Introduction: Low-pressure shunt valves are commonly placed to allow maximum brain expansion and ventricular decompression, particularly in infants. However, there have been few studies that correlated shunt valve pressure with shunt revisions over time.
Methods: The medical records of all inpatients with a diagnosis of shunt malfunction or shunt infection between October 1, 2000 and February 28, 2001 were reviewed through May 1, 2006. 187 patients were divided into two groups: those that had ever had a low-pressure valve, and those that had not. The number of shunt revisions among the two groups was compared.
Results: The low-pressure group included 139 patients, and 48 patients were in the medium/high-pressure group. The low-pressure group had 6831 revisions, an average of 49 revisions per patient. The medium/high pressure group had 502 revisions, or an average of 10.5 revisions per patient. In the low-pressure group, 65 patients, or 46.8%, had had 40 or more shunt revisions. In the medium/high-pressure group, 2 patients had had 40 or more revisions (4.2%). Eighteen patients in the low-pressure group had had more than 100 shunt revisions (13%). None of the patients in the medium/high-pressure group had had 100 shunt revisions. These differences were statistically significant (p=0.0002).
Conclusions: Low-pressure shunting appears to be associated with a dramatically higher rate of shunt malfunction and revision. To our knowledge, this is the first study to correlate historical shunt valve pressures and number of shunt revisions in children.

40. **Percuntaneous Gastrotomy and Nissen Fundoplication Related Infections of Pediatric Cerebral Fluid Shunts**
Cuong Bui, MD; Richard S. Tubbs, PhD, PA-C; Gigi Raymon, CRNP; Traci Morgan, RN; Elise P. Salerno, MS; Douglas Barnhart, MD; Leslie J. Acakpo-Satchivi, MD, PhD; John C. Wellons, III, MD; Walter J. Oakes, MD; Jefferey P. Blount, MD (Birmingham, AL)
Introduction: Infections are the major source of morbidity and mortality in children with ventriculoperoneal shunts (VPS). Unfortunately, many neurologically disadvantaged children with VPS in place have concominant gastrointestinal (GI) issues that require either percuntaneous gastrotomy or nissen fundoplication. However, there is an inherent concern that any procedures that manipulate or enter the GI system may represent a particular risk to the shunt system due to a higher potential for transient bacteremia or to direct contact with or exposure to the shunt during the course of the procedure.
Methods: We retrospectively reviewed the records of all children at Children's Hospital of Alabama who had VPS and also underwent a transcutaneous gastrostomy tube or a nissen fundoplication over an 8 year period.
Results: There were 68 patients in whom there was a functioning VPS in place at the time of the GI procedure. The sexes were evenly represented and the average age was 7 months old. We found the six month infection rate of this cohort to be 15%. The microbiology of the infected shunts did not differ from the usual culprits for VPS infections.
Conclusions: The infection rate in this cohort does not significantly differ from the baseline infection rate of VP shunts with GI procedures. The microbiology of the infected shunts also did not differ significantly from the usual microorganisms responsible for VP shunt infections. These data suggest that perhaps percuntaneous gastrotomy and/or nissen fundoplication do not necessarily put a shunt at additional risk for infection.

41. **Cerebral Mantle Reconstitution after Shunting Infants at Children's Hospital of Eastern Ontario with Severe Hydrocephalus**
Benedicto C. Baronia, MD; Vassilyadi Ventureyra; Abdulghader Alfasi, MD (Ottawa, Ontario, Canada)
Introduction: Cerebral mantle reconstitution (CMR) has been observed in infants born with severe hydrocephalus after insertion of a ventriculo-peritoneal shunt. Reports have appeared in the literature both in clinical and in animal studies.
Methods: Between April 1996-March 2006, fifty-one neonates with shunted hydrocephalus were retrospectively identified. Of these, nineteen had severe hydrocephalus. The neuro-imaging studies, neuro-developmental information were reviewed and Evan's ratios (ER) calculated.
Results: Nineteen (10males, 9 females) had VPS inserted from birth to 9 months of age, with follow up 9 to 54 months (mean 40 months). Three patterns of CMR by ER measurement was noted, significant reconstitution (SR), ER </= 0.3; partial reconstitution (PR), ER <0.5 and >0.3; and no reconstitution (NR), ER >/=0.5. CMR in the SR group (n=9) occurred earliest in one month and longest at 24 months (mean=8months). PR group (n=9) had either any of the varied conditions: IVH, subdural hematomas, infection, shunt revisions, and other congenital lesions. NR group (n=1) had dysplastic cerebrum and ventricles. SR and NR groups were operated on within 3 months of age, while PR group, from neonatal to 9 months of age. All had delay in motor skills. One patient (SR group) had advanced language and cognitive development with social maladaptive behavior consistent with autism.
Conclusions: CMR is an intriguing phenomenon, considering that the brain cannot be compressed and then "re-expanded". Its occurrence may be related to the timing of shunt surgery and it may not occur because of neural development malformations such as cerebral dysplasia.

42. **Antibiotic Impregnated Shunt (AIS) Components are Safe and Efficacious in the Treatment of Infantile Hydrocephalus**
Daniel M. Sciubba, MD; Joseph C. Noggle; Neena I. Marupudi, MS; George I. Jallo, MD (Baltimore, MD)
Introduction: Use of antibiotic-impregnated shunt (AIS) components decrease shunt infections by preventing bacterial colonization that occurs during implantation. Despite studies showing improved efficacy in preventing infection, concern still exists regarding using AIS components in infants, especially premature ones. In this study, clinical outcomes were assessed in infants (<6 months) with hydrocephalus following AIS placement.
Methods: A prospective chart review was conducted involving pediatric patients less than six months of gestational age with hydrocephalus who underwent placement of AIS components (ventriculo-peritoneal, ventriculo-atrial, cysto-peritoneal) as initial treatments or following previous placement of a ventricular access device (VAD, ommaya reservoir). Measured outcomes included: infection, shunt revision surgery, follow-up period, and complications.
Results: Seventy-five patients underwent one hundred eight AIS shunt procedures (30 patients (40%) possessed previous VAD), and all were followed for over six months. Average weight and gestational age at birth were 1,976 grams and 32.5 weeks, respectively. The average age at the time of surgery was 47 weeks. Five infections occurred in five patients (6.9% of patients; 4.6% of procedures), 60% of which were very premature (<32weeks). 33 patients (44%) required shunt revision surgery, five(15%) for infection and 28(85%) for malfunction. No significant peri-operative complications and no mortalities occurred from the procedures.
Conclusion: Use of AIS systems can safely be used to treat hydrocephalus in pediatric patients less than six months old, even for those with a history of prematurity. One possible therapeutic application for such premature patients may be the incorporation of antibiotic impregnated VAD's into management of hydrocephalus.

43. **Internal Cranial Expansion for the Treatment of Slit Ventricle Syndrome: A Technical Note**
Todd C. Hankinson, MD; J. D. Mocco, MD; Brent Kimball, BS; Richard C. E. Anderson, MD; Neil A. Feldstein, MD (New York, NY)
Introduction: Two surgical options are most commonly described for cranial expansion: subtemporal decompression and cranial morcellation. Unfortunately, these techniques often do not increase intracranial volume enough to achieve symptomatic relief. We describe an alternative technique for cranial expansion that has been successful in two patients with slit ventricle syndrome and discuss its advantages and disadvantages.
Methods: Two patients, ages 8 and 14 years, who had undergone CSF diversion before 2 years of age presented with symptomatic and documented elevations of intracranial pressure despite functioning ventriculoperitoneal shunts. CT scans demonstrated slit-like ventricular systems. Each patient was treated with an internal cranial expansion: removal of four large bone flaps, aggressive drilling of the inner table of each flap as well as the adjacent skull, and replacement of the thinned bone flaps.
Results: In both patients, symptoms of increased intracranial pressure resolved. Volumetric measurements comparing preoperative and postoperative imaging studies indicated a significant increase in intracranial volume. This procedure offers the advantage of maintaining the integrity of the calvarium, does not require manipulation of an indwelling ventricular shunt, and achieves a large increase in intracranial volume.
Conclusions: Internal cranial expansion offers an alternative to subtemporal decompression and cranial morcellation in cases of slit ventricle syndrome when cranial expansion is indicated.

44. **Virtual Reality Neurendoscopy**
Jeffrey E. Catrambone, MD; Reza Karmini, MD; Michael Schulder, MD; Peter W. Carmel, MD, DMSc (Newark, NJ)
Introduction: The Dextroscope is an advanced virtual reality imaging center enabling the surgeon to perform cases in virtual reality before performing the actual surgery. Dextroscope allows for real-time volumetric and 3D rendering. It also allows for importing any DICOM including MRI, iMRI, CT, and CTA. In the following paper we report our experience of use of the Dextroscope in studying surgical plans for endoscopic third ventriculostomies.
Methods: The following study is a retrospective study. Five cases of endoscopic third ventriculostomies were evaluated to assess the utility of the Dextroscope in aiding the surgical plans of third ventriculostomies. Three cases were retrospectively studied postoperatively while two cases were studied preoperatively. In all five cases relevant surgical anatomy was assessed via the importation of relevant preoperative images. Detailed assessments of the following structures were assessed in the study: relationship of the foramen of Monroe to proposed entry sites, relevant deep venous anatomy including the septal vein, the thalamostriate vein.
Results: In all cases virtual reality planning enabled a more thorough and detailed understanding of the relevant neuroanatomy for performing third ventriculostomies. Virtual reality planning enabled the complex relationships including the position of the basilar artery and other posterior circulation details more readily than any other radiological images used.
Conclusion: Incorporation of virtual reality will increasingly become more important in the surgical planning of operative cases. The Dextroscope enabled the relationships of a pertinent neuronatomical details to be more completely understood such that surgical planning could be performed with greater confidence.

45. **Demographics and Treatment of Severe Headaches in Children and Young Adults with Shunts**
Harold L. Rekate, MD (Phoenix, AZ); Nalin Gupta, MD; Dory Kranz (San Francisco, CA)
Introduction: Prospective randomized control trials of shunt function and complications of shunting have failed to show differences favoring specific types of valve for the treatment of hydrocephalus. A great deal of energy is being expended to treat the various forms of the so-called "Slit Ventricle Syndrome" despite significant skepticism regarding how serious a problem this is. In order to assess the importance of severe headaches in the life and functional ability of patients with shunts it is important to assess the prevalence of headaches significant enough to impact function in shunt dependent individuals.
Methods: A database maintained by the Hydrocephalus Association was queried regarding the likelihood that any shunted individual would suffer from severe recurrent headaches that interfered with school, work or play.
Results: There were 1038 voluntary responses from patients and their families aged 19 months to 45 years. Severe, frequent and incapacitating headaches were reported in 26.4% of children aged 19 months to 12 years, 41.8% from 13 years to 19 years and 50.1% of patients between 20 and 45 years. This compares to the general population with an incidence of approximately 4%.
Conclusions: Shunt dependent patients have severe headaches related to the shunt dependency. These data support the use of expensive technologies and programmed work-up to improve the quality of life in this rapidly expanding population.

46. **Familial Intracranial Dermoids: Etiopathogenesis and Management Strategies**
Sunil Manjila, MD; Mark Cohen, MD; Georgia Wiesner, MD; Alan R. Cohen, MD (Cleveland, OH)
Introduction: Dermoid cysts are rare intracranial tumors which usually occur in the anterior interhemispheric and posterior fossa regions. There is a paucity of information about inherited dermoid cysts in the neurosurgical literature. The authors present a unique series of familial intracranial dermoids with autosomal dominant inheritance in three consecutive generations.
Methods: The medical records of five family members in three consecutive generations, all with pure intracranial dermoids of the anterior fossa, were studied retrospectively. All patients presented with symptoms of depression and/or seizures. None had cutaneous stigmata (dermal sinus tract), bony abnormalities or other congenital intracranial defects. Karyotyping performed from peripheral blood leukocytes showed no detectable chromosomal rearrangement. A meta analysis of inherited frontonasal dermoids published in the neurosurgical and otolaryngological literature was performed.
Results: We found a pattern of autosomal dominant inheritance in familial intracranial dermoids. Although the natural history of pure intracranial dermoids differs significantly from that of nasal dermoids, both lesions follow similar patterns of genetic inheritance.
Conclusions: Familial intracranial dermoids show a pattern of autosomal dominant inheritance. The authors highlight the importance of detailed family screening and genetic analysis and offer a management algorithm for these benign tumors.

47. **Patterns of Treatment and Tumor Progression in Pediatric Optic Pathway Gliomas**
Rashida Campwala, BA; Mark D. Krieger, MD; Ira Bowen, BA; J. Gordon McComb, MD (Los Angeles, CA)
Introduction: Optic pathway gliomas(OPGs) are rare tumors that commonly present in childhood, and are frequently associated with neurofibromatosis 1(NF-1). The clinical course of these low grade astrocytomas is considered variable, making assessment and standardization of treatment difficult. The purpose of this study is to determine clinical course and treatment efficacy in OPG patients with and without NF-1.
Methods: This IRB-approved,20-year retrospective study reviewed the treatment of 96 children treated with optic pathway gliomas. Age ranged from 7.3months to 19.8years(mean 6.2 years). 57% of the patients were female and 43%male. 43% of the patients had NF-1.
Results: No patients died of their disease during the study period. 50 patients (52%) underwent surgery for progressive disease, whereas the rest were followed conservatively. Mean duration of symptoms prior to surgery was 1.5 years (range 1 month to 10 years). Of these patients, 31% had unilateral tumors of the optic nerve alone, 56% had tumors of the chiasm/hypothalamus, and 13%had tumors that included the optic radiations. NF-1 patients were less likely to have tumor progression and surgery. Patients who presented at a younger age were more likely to have progression and surgery. GTR was achieved in 25% of the surgical patients (all of whom had unilateral tumors of the optic nerve), whereas 69% underwent subtotal resection, and 6% had biopsy only. Overall progression was 18.8% with a mean progression time of 2.5 years after surgery. 44% of patients received chemotherapy, 6% received chemotherapy combined with radiation therapy, while no patients received radiation therapy only.
Conclusions: he treatment of optic pathway gliomas requires individually tailored therapy. Younger patients and those without neurofibromatosis are more likely to have disease progression and to require additional therapy.

48. **Radical Resection of Pediatric Craniopharyngiomas and the Long Term Effects on Quality of Life**
Kevin E. Hsieh, MD; Jeffrey Wisoff, MD (New York, NY)
Introduction: Management of craniopharyngiomas continues to be controversial. The morbidity of total resection vs. partial resection and radiation therapy (XRT) must be evaluated in long term studies. We present a series of 80 (55 primary and 25 secondary) consecutive pediatric patients with craniopharyngiomas requiring 92 surgeries over the last 21 years.
Methods: We retrospectively evaluated their actuarial survival, disease free survival, need for endocrine replacement, pre and postoperative vision, Body Mass Index (BMI), and when applicable, neuropsychological evaluation. Gross total resection (GTR) was the operative goal with each surgery.
Results: Mean follow was 89 months. GTR was achieved in 87% with subtotal resection in 13%. All 55 of the primary tumors had a GTR (100%) and 15/25 (60%) of recurrent tumors had a GTR. There were 20 recurrences of tumor after resection (26%). 9 recurrences occurred in primary tumors (16%) and 11 occurred in secondary tumors (44%). There were 10 deaths (13%); 4 were perioperative, 2 were from disease progression, and 6 were from other causes. 7 of these deaths occurred in recurrent tumors. Average BMI in 39 patients with available data was 27 with 4 (10%) morbidly obese patients (BMI > 40). 97% (68/70) of surviving patients required endocrine replacement.
Conclusions: Radical resection for surgical cure has an excellent progression free survival and overall survival. Morbidity and quality of life is at least comparable to partial resection with XRT. The greatest reaming problem remains with treatment of recurrent craniopharyngiomas.

49. **Optic Pathway Glioma; A New Surgical Observation**
Jessica Clevenger; Marike Zwieneberg-Lee, MD; Frederick A. Boop, MD; Robert A. Sanford, MD (Memphis, TN)
Introduction: In 2006 there remains a controversy regarding the role of radical surgery in children with chiasmal gliomas. We've treated over 100 children with biopsy followed by chemotherapy and/or irradiation. When 2 children failed standard chemotherapy, irradiation, and investigational chemotherapy we performed radical surgical removal attempting to save the child's life, which revealed tumor involving one optic nerve and chiasm, and spared the other optic nerve and tract. In each there was very poor vision in the affected eye, but good vision contra laterally. This prompted review of our optic pathway series visual data to determine if we could detect how often vision in one eye was preserved.
Methods: We retrospectively reviewed ophthalmological records and one or more MRI scans for 85 children with optic pathway tumors treated at our institution between 1986-2006.
Results: In these 85 children we found no anatomical correlation between visual exam and MR findings except in tumors restricted to one optic nerve including 25 large hypothalamic tumors which had preserved vision unilaterally. Recently we aggressively resected 3 giant midline tumors in children with preserved unilateral vision. At surgery each of these were found to have tumor involving one optic nerve and chiasm with preserved visual field and normal nerve on the opposite side.
Conclusions: This has led us to propose an anatomical classification of optic pathway tumors that seems to fit the patterns of visual impairment. We propose a change in the surgical management based upon these anatomical patterns.

50. **Treatment of Recurrent Ependymoma**
Marike Zwienenberg-Lee, MD; Frederick A. Boop, MD; Thomas E. Merchant, DO; Robert A. Sanford, MD (Memphis, TN)
Introduction: Children with recurrent ependymoma previously treated with surgery and radiation are considered incurable.
Methods: A retrospective review of our series of ependymomas treated between 1982 and 2004 revealed 32 children (2-16.9 years) with recurrent ependymoma.
Results: Twenty-nine were reoperated in an aggressive fashion with multiple surgical approaches to 1-5 lesions usually at one surgical intervention. Following maximal surgical resection 3 modes of radiation were used; radiosurgery in 9 children (early in the series) with one long term survivor (20 years); focal fractionated reirradiation was used in 9 with 6 (66%) having no evidence of disease (NED) and craniospinal in 17 with 9 (53%) (NED) followed 18-124 months. Complications of this aggressive treatment will be presented in detail.
Conclusions: Maximum surgical resection resulting in minimal disease followed by irradiation results in long term survival and cure.

51. **Long-term Survival in Patients Diagnosed with Atypical Teratoid/Rhabdoid Tumors**
Manuel Ferreira, MD, PhD; David Ebb, MD; William E. Butler, MD (Boston, MA)
Introduction: Atypical teratoid/rhabdoid tumors (ATRT) are associated with poor prognosis. Despite aggressive therapy including surgical resection, radiation and multi-agent chemotherapy, the mean survival is less than 10 months. Reports of survivors continue to grow (17 survivors with mean follow-up < 2 years). We report a series of seven patients (three males and four females; mean age at diagnosis 1.6 years) given the diagnosis of ATRT at surgery and their clinical outcome and follow-up. Four of these patients are free of disease at a mean of 4.4 years after diagnosis. We describe seven patients with the diagnosis of ATRT (a right frontal mass, a pineal region mass, three posterior fossa masses, a thoraco-lumbar lesion and a patient with both renal and intraventricular masses), treatment rendered and clinical follow-up. Symptoms at presentation were referable to the location of the lesions. All patients received surgical intervention (four gross total resections (3 posterior fossa and 1 pineal region tumor)). Five patients then received combination chemotherapy (variations of the parameningeal rhabdomyosarcoma protocol of Olson et al, 1995) and focal radiation with protons (one 4 year old patient received low dose cranio-spinal radiation). Four of the five that received aggressive chemotherapy and radiation are alive today without evidence of recurrent disease (survivor follow-up; mean 4.4 years). These data in this series of patients adds to the growing number of survivors in the literature. This protocol that includes intensive chemotherapy followed by focal proton beam radiation may confer better long-term survival than previously reported.

52. **The Role of Neurosurgical Management in Children with Langerhans Cell Histiocytosis**
Laurence Davidson, MD; J. Gordon McComb, MD; Ira Bowen, BA; Mark D. Krieger, MD (Los Angeles, CA)
Introduction: Langerhans cell histiocytosis (LCH) is a rare disease whose course and optimal treatment are not fully known. The goal of this study was to review a large series of LCH patients with cranio-spinal lesions in order to assess the long-term course, outcome and efficacy of treatment of the disease.
Methods: Forty-four patients with LCH who presented to a single pediatric neurosurgical department between 1976 and 2005 were retrospectively reviewed.
Results: This series included 29 boys and 15 girls, ranging in age from 2 months to 13 years (average 5 years). The mean follow-up was 4.5 years. Twenty-seven (61%) had unifocal bone lesions, 12 (27%) had multifocal bone disease, 2 (4.5%) had lesions in the hypothalamic-pituitary axis, and 3 (7%) had multiple organ involvement. Five of the patients (17%) with unifocal disease at presentation had subsequent development of new lesions. Four of the patients (33%) with multifocal bone disease at presentation had delayed development of new lesions during the follow-up period. Two of the 3 patients (66%) with multiple organ LCH died. Age less than 2 years at the time of initial presentation was a risk factor for both multifocality and dissemination.
Conclusions: This series of LCH patients demonstrates the need for extent of disease evaluation both at presentation and follow-up. Patients with unifocal LCH can be effectively treated with surgery alone; however, systemic therapy should be considered for dissemination. Very young patients are more likely to have multifocal disease and disseminations, and will usually require systemic therapy to control their disease.

53. **Radiation-induced Injury Following Gamma Knife Stereotactic Radiosurgery in Pediatric Patients with Intracranial Tumors and Arteriovenous Malformations**
Lewis C. Hou, MD; Amy L. Sun; Tiffany Prugpichailers; Victor K. Tse, MD, PhD; Michael SB Edwards, MD (Stanford, CA)
Introduction: Radiation-induced injury is well defined in adults who undergo radiotherapy or radiosurgery. However, limited literature exists regarding this phenomenon in the pediatric population. In this study, we examined the incidence and management of radiation-induced injury among pediatric patients treated with Gamma Knife Stereotactic Radiosurgery.
Methods: Records of 37 pediatric patients treated by the senior author between 1997 and 2005 were retrospectively reviewed. Those with radiographic injury (significant edema and/or necrosis) were stratified to acute (within 3 months), sub-acute (3-10 months), or delayed (after 10 months) groups.
Results: The cohort consists of 23 male and 14 female patients, with median age of 11 years (2 to 18 years). Twenty-nine were treated for intracranial tumors (average 16.1Gy) and eight for AVM (24Gy). Within tumor group, 17.2 percent developed acute injury, 10 percent developed clinical symptoms, and 7 percent required prolonged steroid therapies. The average duration was 13 months (2-27mo). Only 7 percent developed subacute injury, and the duration was 12.5 months (7-18mo). No AVM patients experienced acute injury. 50 percent developed subacute injury with majority having clinical symptoms. The injury duration was 21.3 months (9-37mo). Only one patient required steroids, but significant side-effects were encountered.
Conclusions: Significant incidence of acute and subacute radiation injury can develop in the pediatric population. Although radiographic injury can be remarkable and is often prolonged, excellent recovery can occur without intervention. In rare cases where symptoms warrant steroid therapy, difficulty with weaning may be encountered. The observed differences between tumor and AVM patients suggest the underlying injury mechanisms may be different.

54. **Brainstem Lesions in Neurofibromatosis 1**
Nicole J. Ullrich, MD, PhD; Ali Raja, MD; Mark W. Kieran, MD, PhD; Karen J. Marcus, MD; Liliana Goumnerova, MD (Boston, MA)
Introduction: The presence of multiple, non-enhancing areas of hyperintensity without mass effect are well recognized on magnetic resonance imaging in neurofibromatosis 1 patients. Expansile areas of localized enlargement along with signal change in the brainstem are less commonly noted. The neuroimaging characteristics and natural history of brainstem lesions in patients with Neurofibromatosis type I are poorly understood. It is unclear if these lesions represent a variation of the commonly described "NF spots" or whether they define a distinct clinical entity.
Methods: Clinical data on all children with NF1 who were evaluated at CH/DFCI were reviewed. The study was approved by the IRB at CH Results: 258 patients had undergone imaging studies. 23 had evidence of brainstem mass lesions. Nearly half (12/23) were located in the medulla. The majority did not enhance. Length of follow-up was 68.8 months. Patients were divided into two groups (treated or not treated) and their natural history was similar.
Conclusions: The outcome for children with NF1 and brainstem lesions is favorable and suggest conservative management.

55. **Abnormal Diffusion Characteristics in Pediatric Supratentorial Brain Tumor, a DTI Study**
Andrew W. Grande, MD; Weihong Yuan, PhD; Scott K. Holland, PhD; Blaise V. Jones, MD; Kerry R. Crone, MD; Francesco T. Mangano, DO (Cincinnati, OH)
Introduction: Diffusion tensor imaging (DTI) is an advanced MRI technique that can detect in vivo white matter integrity based on the magnitude (mean diffusivity, MD) and directionality (fractional anisotropy, FA) of the anisotropic water diffusion property. We studied DTI during the pre-operative evaluation of newly diagnosed supratentorial brain tumors.
Methods: Between September 2005 and July 2006, we identified 11 patients (M/F=7/4; age range 1-15y; low/high grade = 8/3) who underwent DTI for pre-surgical planning and examined the difference in MD and FA values in various white matter regions (paired t-test) and between low-grade and high-grade tumor patients (Mann-Whitney U-test).
Results: For all subjects, the tumoral MD value was significantly higher than that in the adjacent normal appearing white matter (NAWM, p=0.0014) and contra-lateral NAWM (p=0.0031). The FA value in tumor was significantly lower than peritumoral regions (p=0.0003) and contra-lateral NAWM (p=0.0001). Additionally, the MD value in low-grade tumors was significantly (P<0.05) higher than high-grade tumors.
Conclusion: Within the tumor, the increased water diffusivity and reduced diffusion directionality may be a reflection of increased extra cellular water content and degenerated white matter tracts. MD value differences between high and low grade tumors may aid in pre-operative differential diagnosis. In peritumoral regions the white matter of both high and low grade tumors is not significantly different from NAWM. This represents a difference from adult studies. Further investigation is needed to elucidate the potential of MD and FA for differential diagnosis and evaluation of white matter integrity in supratentorial pediatric brain tumors.

56. **Gene Expression Profiling of Malignant Rhabdoid Tumors and the Implications**
Manuel Ferreira, MD, PhD; Scott L. Pomeroy, MD, PhD (Boston, MA)
Introduction: Malignant rhabdoid tumors (MRTs) occur in the kidney, soft tissues and the central nervous system (atypical teratoid/rhabdoid tumors, ATRTs). ATRTs make up 2% of pediatric brain tumors. Despite aggressive therapy mean survival is less than 10 months. Mutations or deletions of the hSNF5/INI1 gene on chromosome 22q11.2 occur in approximately 70% of these tumors. Gene expression profiling can be useful in risk stratification, outcome prediction and in guiding therapy in numerous cancers (including medulloblastomas; Pomeroy et al, 2002). Gene expression profiling may give insight into a deadly tumor that on average recurs and metastasizes regardless of therapy. We collected samples of 39 MRTs (24 ATRTs, 8 renal and 7 extra renal rhabdoid tumors). All tumors were defined by decreased expression of the INI1 gene product. Deletions of chromosome 22 or mutations in the INI1 gene are also presented. We performed gene expression profiling using DNA micro arrays (Affymetrix U133 arrays). Analysis was performed by principal component analysis (PCA), non-negative factorization (NMF) and gene set enrichment analysis (GSEA). Using NMF consensus analysis, the MRT dataset segregated into four distinct groups. We applied GSEA methodology to the 4 NMF classes and found that despite all tumors having a loss of function event of the INI1 gene, they were defined by distinct gene set enrichment profiles. Gene expression profiling of a cohort of 39 MRTs provides evidence for multiple subgroups. These subgroups may utilize different pathways and be susceptible to different treatment strategies. We present this data and the possible implications including risk stratification, outcome prediction and novel treatment strategies.

57. **Micro Array Profiling of Childhood Ependymoma Identifies a Distinct Gene Subset Related to AKT2 Over Expression**
Timothy E. Van Meter, PhD; Gary W. Tye, MD; Morgan McCrocklin; John D. Ward, MD; Catherine I. Dumur, PhD; William C. Broaddus, MD, PhD (Richmond, VA)
Introduction: Ependymomas are common childhood neoplasms whose molecular phenotype remains poorly defined.
Methods: Pediatric ependymoma tissue specimens were examined for AKT2 experession levels by western blotting and Taqman quantitative PCR assays. Samples with high AKT2 expression and high AKT activity were examined by Affymetrix HG-U133A micro arrays.
Results: Comparison of AKT over-expressing tumors versus tumors with expression levels non-different from normal brain yielded 213 significant genes (p=0.01). Genes were chosen for further validation studies based on their potential relation to cell cycle, AKT signaling or invasiveness. Slingshot 1 was of interest with respect to AKT signaling since findings suggest that SSH, Slingshot protein 1, is a downstream target of PI3K and interacts with Lim, Actin, and Cofilin/ADF to alter cytoskeletal structure during the cell cycle. It appears to play a role in the later stages of mitosis by dephosphorylating and reactivating Cofilin during cytokinesis and could play a role in motility as well. Three other identified genes, SPON1, CSPG5, and FBN1 are extracellular matrix (ECM) proteins which could be involved in the restructuring of the tumor cell microenvironment to promote growth. PAM, Protein associated with Myc, was another identified gene implicated in cell growth.
Conclusions: AKT2 over-expression in a subset of ependymomas appears to be associated with enhanced expression of several genes which may contribute to the malignant growth through action during the cell cycle, angiogenesis, or cell motility processes. None of the genes identified have been previously studied in childhood brain tumors and deserve further examination.

58. **Greatly Impaired Migration of Aquaporin-4 Deficient Astroglial Cells After Implantation into Mouse Brain**
Kurtis I. Auguste, MD; Geoffrey Manley, MD, PhD; Victor Perry, MD; Peter Sun, MD; Nalin Gupta, MD; Alan S. Verkman, MD, PhD (San Francisco, CA)
Introduction: Aquaporin-4 (AQP4) water channels are expressed in brain astroglia. We reported previously that astroglial cells cultured from AQP4-deficient (AQP4-/-) mice migrate more slowly in vitro than those from wildtype (AQP4+/+) mice. Here, we show impaired migration of AQP4-/- astroglia after implantation into brains of wild type mice in which directional migration was stimulated by stab injury.
Methods: Fluorescently labeled astroglial cells were injected into the frontal lobe 2 days after creation of planar stab wound 3 mm from the axis of the injection needle. Two days after cell injection we determined the location, elongation ratio and orientation of fluorescent cells.
Results: Migration of AQP4+/+ cells toward the stab was >5-fold greater than away from the stab, with >25% migrating cells being elongated (axial ratio > 2.5). In contrast, few (<3 %) elongated AQP4-/- cells were seen, the AQP4-/- cells moved comparably toward vs. away from the stab, and they moved on average only 0.6 mm away from the injection site toward the stab compared with 1.5 mm for AQP4+/+ cells. In transwell assays, the migration of AQP4-/- astroglia was greatly slowed compared with AQP4+/+ cells in a manner that depended on pore size. At 8 hours, ~50 % of AQP4+/+ cells migrated through 8 µm diameter pores whereas comparable migration of AQP4-/- cells was found for 12 µm diameter pores.
Conclusions: These results provide in vivo evidence for AQP4-dependent astroglial cell migration. Modulation of AQP4 expression or function might provide a new strategy to alter glial scarring in various brain pathologies.

59. **Spontaneous Hemorrhage in Pediatric Brain Tumors**
Mony Benifla, MD; Suzzane Laughlin, MD; Ute Bartels, MD; Maria Lamberti-Pasculli, RN; James T. Rutka, MD, PhD; Peter B. Dirks, MD, PhD (Toronto, Ontario, Canada)
Introduction: Spontaneous intracranial hemorrhage (SICH) due to a brain tumor is uncommon and has been reported mainly in adults.
Methods: We reviewed the clinical history, radiological findings, treatment and outcome of the children who presented with SICH caused by a tumor over a period of 10 years (1996-2005). We also studied the total number of children presenting with SICH over the same time period.
Results: During the study period, 557 patients with newly diagnosed intracranial tumors were operated in our hospital. Seventeen (3%) had SICH at the time of presentation. There were 9 males and 8 females. At the time of arrival 14 (82%) experienced decreased level of consciousness (GCS 4-14). In five children the preoperative imaging studies failed to demonstrate tumor, and the differential diagnosis was AVM or cavernoma. The location of tumors that bled was infratentorial in two patients, suprasellar in 3, pineal in 2 and cerebral hemispheres in 10. Histopathological diagnosis found GBM in 3 patients, anaplastic astrocytoma in 2, medulloblastoma/PNET in 2, and in 6 (35%) patients a benign neoplasm was diagnosed. Of 192 children with SICH in the same period, the most common etiology was AVM in 77 patients (40%), followed by cavernoma in 30 (16%), and then hemorrhage into tumor (9%).
Conclusions: When a child presents with SICH, brain tumor should be considered in the differential diagnosis. We found relatively high rates of low grade brain tumors that can present with hemorrhage. Supratentorial tumors are overrepresented in this group.

60. **Identification of Inhibitors of Pediatric Brain Tumor Stem Cells**
Ichiro Nakano, MD, MSc; Michael Masterman-Smith; Jorge A. Lazareff, MD; Steve Horvath, MD; Linda Liau, MD, PhD; James Washek, MD; Daniel H. Geschwind, MD, PhD; Stanley Nelson, MD, PhD; Paul Mischel, MD; Harley I. Kornblum, MD, PhD (Los Angeles, CA)
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 the normal stem cells in the corresponding organs. Previously, we found that a gene encoding the serine/threonine kinase, maternal embryonic leucine zipper kinase (MELK), is highly expressed in neural stem cells in the central nervous system and regulates their proliferation. Therefore, we hypothesized that MELK is also upregulated in brain tumor stem cells (BTSC) and regulates their proliferation.
Methods: (1) We examined MELK expression in BTSC, isolated from pediatric GBM and MB. (2) We tested MELK function in BTSC cells with siRNA treatment. (3) We screened our small molecule libraries to identify MELK inhibitors in order to arrest proliferation of pediatric BTSC.
Results: (1) MELK was found to be highly activated in stem cells in malignant brain tumors. (2) Down regulation of MELK by siRNA inhibited formation of secondary neurospheres under clonal condition, which indicated that MELK is required for proliferation of BTSC. (3) Several small molecules were found to inhibit proliferation of BTSC. The effects of some of the candidate drugs are thought to be due to MELK inhibition.
Conclusions: MELK is highly expressed in some BTSC, and regulates their proliferation. Inhibition of this gene can target stem cell component in pediatric malignant tumors, leading to growth inhibition of the entire tumor mass.

61. **Primary Vertebral Neoplasms in the Pediatric Patient**
Albert J. Fenoy, MD; Arnold H. Menezes, MD; Jeremy D.W. Greenlee, MD; Kathleen A. Donovan, ARNP, MSN; Yutaka Sato, MD (Iowa City, IA)
Introduction: Tumors arising from the vertebrae in the pediatric population are uncommon and present a difficult management scenario. Given the unique developing anatomy and complex issues of continued skeletal growth and spinal stability, we sought to evaluate the decision-making process and outcomes of surgical intervention.
Methods: A retrospective review of University of Iowa medical records and radiographs from 1951 to 2004 was performed. Inclusion criteria were age less than 18 years at time of diagnosis and histopathology consistent with origination from vertebral bone.
Results: Sixty-one patients were identified. There were 41 histologically benign and 20 malignant tumors. Patients presented most frequently with pain (79%) and neurologic deficits (67%). The duration of symptoms was significantly shorter in the most recent decade of patients (13 weeks) than those in earlier years (20 weeks). Tumor excision was achieved in 77%. 74% of patients noted complete symptom resolution following treatment, whereas 14% realized no improvement, all in malignant subtypes. Recurrence was seen in 7 patients; with average follow-up of 10.3 years, the overall mortality rate was 6.5%, occurring only with malignant tumors.
Conclusions: Our current approach to treatment of spinal neoplasms reflects lessons learned over the 6 decades of treatment documented in this series. Preoperative tumor embolization was a useful adjunct to surgical resection. Motion-sparing surgical procedures with limited fusion segments preserved axial mobility. Clinical suspicion must prompt early diagnostic imaging to reduce delay in treatment; when warranted, early intervention with single stage complete resection and fusion offers the best symptomatic relief.

62. **Aquaporin-1 Membrane Channel Protein Level is Decreased in Developing H-Tx Rat Brains**
Mohammad Nabiuni, PhD; Swinburne A. Augustine, PhD; Leena Paul, MA; Mohamed Gharnit; Jogi V. Pattisapu, MD, (Orlando, FL)
Introduction: The normal brain develops and functions in a stable, well-defined environment with precise water movement control. In congenital hydrocephalus, there is excessive cerebrospinal fluid (CSF) accumulation in the brain that negatively impacts water homeostasis. Aquaporins are a family of bidirectional transmembrane water channel proteins that are involved in several neurologic conditions and play a significant role in the developing brain, possibly involved in congenital hydrocephalus.
Methods: We studied the regulation of aquaporin-1 (AQP1), in the hydrocephalus-Texas (H-Tx) rat model to investigate its role in the pathophysiology of this condition. Hydrocephalus develops in these animals due to obstruction of the cerebral aqueduct on embryonic age day 18, and the condition is fatal by 4-5 weeks of age. AQP1 protein expression was evaluated in unaffected H-Tx animals, affected hydrocephalic (HC) animal and Sprague-Dawley (SD) control animals at embryonic ages E17 and E19, and post natal ages P3 and P10. Immunohistochemistry, western blot analyses, and ELISA assays were performed.
Results: Our findings indicate that AQP1 is down-regulated in the congenital H-Tx and affected (HC) animals compared to SD control animals. The decrease occurs at day E17, one day before aqueduct stenosis in this animal model. Postnatally, the decrease in AQP1 is more evident at age P10, suggesting this might be a long standing phenomenon.
Conclusion: AQP-1 may play an important role in the production or absorption of CSF in the early gestation period of congenital hydrocephalus. The molecular aspects of early development in this rodent model may involve an abnormality of aquaporin regulation.

63. **Subdural Hematoma in the Setting of Subarachnomegaly**
Daniel J. Curry, MD; Malini Narayanan, MD, PhD; Bakhtiar Yamini, MD; David Frim, MD, PhD; Kelly Staley, MD; Jill Glick, MD (Chicago, IL)
Introduction: Hemorrhage into the subdural space in children can occur as a result of impact and inertial forces and are frequently associated with child abuse. In cases of cranio-cerebral disproportion, the hemorrhage can occur from minor differential inertial forces on the brain and the meninges resulting in bridging vein rupture. In a particularly common form of congenital cranio-cerebral disproportion, subarachnomegaly, the incidence of subdural hematoma resulting from minor trauma and the relevance of this finding to the child abuse evaluation is unknown.
Methods: CAT scans and MRI of the brain of 182 patients reported to the Child Protective Service at the University of Chicago Comer Children's Hospital were reviewed over a period of six years. A full forensic evaluation was performed on all patients and the injuries were treated for the surgical lesion when indicated.
Results: Fifty-six cases of subarachnomegaly were identified in the 182 patients undergoing CPS evaluation. In twenty-seven cases of moderate to severe subarachnomegaly, subdural hematomas were present in 24 cases compared to 3 cases without hematomas. In twenty-seven cases of minor subarachnomegaly, subdural hematomas were present in 14 cases, and absent in 13 cases.
Conclusion: Minor traumatic brain injury can result in subdural hematoma in the setting of subarachnomegaly. There is an increased incidence of subdural hematoma in head injury with and increased degree of subarachnomegaly. The significance of subdural hematoma in the setting subarachnomegaly and its role in the diagnosis of inflicted head injury is discussed.

64. **Folate Receptor Function is Essential in CNS Recovery after Injury: Evidence in Knockout Mice**
Elias B. Rizk, MD, (Harrisburg, PA); Bermans J. Iskandar, MD (Madison, WI)
Introduction: We have previously shown that folic acid supplementation significantly improves CNS repair after injury. Since folic acid is intimately dependent on receptor availability to function, we studied the role of the 2 types of folate receptors in CNS regeneration and recovery.
Methods: After a standard rat spinal cord injury, in situ hybridization and immunohistochemistry of the Reduced Folate Carrier (RFC-1) and the Folate Binding Protein (FBP-alpha) were performed on the spinal cord tissue. Based on positive FBP-alpha results, mice that underexpress FBP-alpha were subjected to well-established spinal cord and optic nerve regeneration in vivo experiments, in which a sciatic nerve graft is transplanted microsurgically at the cervical dorsal column injury site, and the injured optic nerve respectively. Regeneration of the spinal or retinal neurons into the grafts was then assessed with retrograde fluorescent tracing.
Results: While the mRNA and protein levels of the RFC-1 receptors were unaffected by spinal cord injury, the levels of the high affinity FBP-alpha receptors were dramatically increased. Furthermore, the mouse experiments showed that a decreased expression of the FBP-alpha receptor significantly reduced the ability of both the spinal cord and retina to regenerate after injury compared to wild-type mice.
Conclusions: The significant pro-regenerative effect of folic acid in the CNS seems to be at least partially mediated by one type of receptors (FBP-alpha) that transports folic acid into the cell. Thus, optimizing the delivery and use of folate may be beneficial to CNS repair, and may greatly impact recovery after stroke, trauma, and surgery on the brain and spine.

65. **Repeat CT Imaging in Pediatric Traumatic Brain Injury: When Does it Make a Difference?**
Susan R. Durham, MD, (Lebanon, NH); Kenneth Liu, MD; Nathan Selden, MD, PhD (Portland, OR)
Introduction: The purpose of this study was to evaluate the risk of radiographic progression of traumatic intracranial lesions in children. Targeting repeat CT imaging to patients with higher risk lesions may reduce radiation exposure, need for sedation and cost in pediatric patients.
Methods: A retrospective cohort study of 268 patients less than 18 years of age who underwent a repeat CT within 24 hours of their initial CT was performed. The risk of radiographic progression between initial and repeat CT imaging and need for delayed neurosurgical intervention was determined for each lesion type.
Results: 54 (20.1%) patients had a negative initial CT study which did not change on subsequent imaging. 61 (28.5%) of the 214 patients with positive CT findings demonstrated progression. Epidural hematoma (EDH) (OR 12.29), subdural hematoma (SDH) (OR 3.18), cerebral edema (OR 9.34) and intraparenchymal hemorrhage (IPH) (OR 18.3) were found to have a significant increased risk of progression as well as need for delayed neurosurgical intervention (combined OR 11.91). No significantly increased risk was found for subarachnoid hemorrhage (SAH), intraventricular hemorrhage (IVH), diffuse axonal injury (DAI) or skull fractures.
Conclusion: Repeat CT imaging of high-risk lesions such as EDH, SDH, cerebral edema and IPH is recommended in the management of pediatric patients. Repeat CT imaging of low-risk lesions, such as SAH, IVH, DAI and isolated skull fractures, in the absence of clinical deterioration, may be less likely to alter clinical management. Limited benefits of repeat imaging in these patients should be weighed carefully against the potential risks of repeat imaging.

66. **The Open Terminal Myelocystocele: An "Exposed" Neural Tube Defect of Secondary Neurulation**
Michael J. Burke, MD, FACS (Corpus Christi, TX)
Introduction: Open neural tube defects result from a failure of primary neurulation to proceed to complete closure of the neural tube and skin. Defects of secondary neurulation are closed as defined by intact skin over the abnormality. Presented here is a previously unreported exception to those rules.
Methods: Seven patients comprise this series. They were, on initial examination, diagnosed with a myelomeningocele and taken to surgery for closure. The anatomic findings were not compatible with that diagnosis and operative photos will support that contention.
Results: The lesions lacked a typical placode, median groove, and pial/neurocutaneous junction. A closed neural tube one to four inches in length exited the plain of the spine to traverse an open sac of redundant skin and attach to a normal skin edge. All defects involved the terminal spinal cord. The lesions were open with respect to skin and the terminal spinal cord in that a central canal ballooned open at the cutaneous junction. All patients had hydrocephalus requiring shunts. Three had no lower extremity function yet one had the smallest defect. Three patients were intact to an L5-S1 level, yet had massive defects. One was intact to S3-4.
Conclusions: The surgical anatomy of these lesions is that of a terminal myelocystocele. It is suggested that this lesion which originates from secondary neurulation was initially closed. Progressive distention of the overlying skin occurred and ultimately ruptured. Hydrocephalus may be the underlying precipitating factor. The timing of rupture and amniotic fluid exposure leads to neurological dysfunction incongruent with the anatomy of the lesion.

67. **Dynamic Cervicomedullary Cord Compression and Alterations in Cerebrospinal Fluid Dynamics in Children with Achondroplasia**
Moise Danielpour, MD; Bill Wilcox, MD; Yasmin Alanay, MD; David Rimoin, MD, Prof (Los Angeles, CA)
Introduction: Achondroplasia (ACH) is the most common of the heritable skeletal dysplasias. A stenotic Foramen Magnum can result in significant craniocervical junction compression resulting in myelopathy, hypotonia, sleep apnea and even sudden death. Majority of these children will gain normal motor and intellectual development, are not at risk for sudden death, and do not require surgical intervention. We utilize MRI cerebrospinal fluid (CSF) flow studies in assessing children with Cervicomedullary junction compression. Recently we have identified several children severely symptomatic with normal MRI and Flow studies in neutral position, but complete blockage of CSF flow on Flexion and more dramatic posterior cervicomedullay compression on extension studies. These children underwent decompressive surgery with dramatic improvement or resolution of signs and symptoms. We propose that there is an increased risk for dynamic cord compression in ACH that constitutes an indication for surgical decompression at the cervicomedullary junction.

68. **Modified Osteoplastic Orbitozygomatic Craniotomy in the Pediatric Population**
Matthew L. Miller, MD; Sean M. Lew, MD; Cheryl A. Muszynski, MD; Bruce A. Kaufman, MD (Milwaukee, WI)
Introduction: Anterior and anterolateral skull base approaches offer the advantages of improved visualization and minimal brain retraction for lesions involving the orbital apex, parasellar regions, and anterior and middle fossa floors. These approaches are seldom used in the pediatric population due to the perceived increase in morbidity and surgical complexity. We report the application of the previously described modified osteoplastic orbitozygomatic (OZ) craniotomy to pediatric neurosurgical cases. This approach offers a number of advantages and is technically straightforward.
Methods: The results from four pediatric cases are reported. Age ranged from 25 mo - 16 y, with a follow-up period of 3 - 18 mos. Pathology included craniopharyngioma (3), and frontal epidural abscess/subdural empyema with intraorbital extension (1).
Results: No complications related to the surgical approach were noted. In all cases good postoperative cosmesis was achieved with excellent realignment of the orbital rim. Temporalis muscle bulk was preserved and symmetric in all cases.
Conclusions: The modified osteoplastic OZ craniotomy can be safely and effectively applied to the pediatric population. Advantages include: 1) ease of use; 2) superior exposure and therefore less brain retraction; 3) an easily replaced one-piece bone flap which obviates the need for plating/suturing at the orbital rim; 4) a vascularized bone flap less susceptible to infection; and 5) maintenance of normal temporalis muscle anatomy for improved cosmesis and function.

69. **Analysis of Subdural Empyema: A Retrospective Study**
Jeffrey E. Catrambone, MD; Serena Fernandes, BA; Charles Prestigiacomo, MD; Peter W. Carmel, MD, DMSc (Newark, NJ)
Introduction: Subdural empyemas remain as an important pediatric neurosurgical clinical problem. The following study is a retrospective review of 13 patients treated at one institution over the past 3 years.
Methods: A retrospective chart review of patients surgically managed for intracranial empyema from February 2003 to May 2006 at University Hospital. Age of patient, location of lesion, caustive agent, length of stay, method of treatment and outcome were among the variables studied.
Results: 13 patients, 9 male (69%), with a mean age of 16 years were identified with all but one patient returning positive cultures. Identification of microbial agent was based on empyema collection cultures with three exceptions where the determination was based on CSF (n=2), blood (n=1) and sinus collection (n=1). Of the organisms isolated, Streptococcus species accounted for the majority (72.7%), followed by Staphylococcus species (9.1%), Prevotella (9.1%), Bacteriodes capillosus (4.5%) and Haemophilus aphrophilus (4.5%) All patients survived.
Conclusions: The majority of patients in our series were young males (61.5%), an association noted in numerous previous studies (1) The majority of these studies, however, focused on intracranial complications in the context of sinusitis and ascribed male predominance to large sinuses as well as the rapid growth of frontal sinuses in the second decade of life in males. (1) In our series, of 9 males treated for intracranial empyema, 8 (88.9%) had concurrent diagnoses of sinusitis, as compared to similar diagnoses in only 2 female patients (50%). The higher rate of subdural empyema in males may be related to increased incidence of sinusitis.

70. **Central Nervous System Blastomycosis in Children- The University of Manitoba Experience**
Michael J. Ellis, BSC; Patrick J. McDonald, MD, FRCSC (Winnipeg, MB, Canada)
Introduction: Blastomycosis, a systemic granulomatous infection caused by the fungus Blastomyces dermatitidis is endemic to parts of the Great Lakes of Canada and the Ohio and Mississippi River basins. Central nervous system (CNS) involvement has rarely been described in children. CNS blastomycosis infection represents a unique management challenge to the pediatric neurosurgeon. We present the largest known series of CNS blastomycosis in children.
Methods: A prospective surgical database was established at Winnipeg Children's Hospital in July 2001. We retrospectively searched for all operative cases with a diagnosis of blastomycosis in the neuraxis. Six patients were identified and their hospital charts reviewed.
Results: Six patients with CNS blastomycosis were identified; five with intracranial disease and one with spinal cord involvement. Median age was 11(range 3-16), with five males and one female. Three patients underwent craniotomy for drainage of brain or epidural abscesses, three underwent open or endoscopic biopsy of granulomatous lesions. All received a minimum of eight weeks of systemic antifungal therapy with resolution or improvement of clinical and radiographic findings. Follow-up ranges from 3 months to 4 years. Two patients have not yet completed a full course of antifungals. There have been no episodes of recurrence.
Conclusions: CNS blastomycosis is a rare but serious condition. Open, stereotactic, or endoscopic biopsy should be considered for children presenting with a mass lesion of unknown etiology with or without a history of systemic blastomycosis. Postoperatively, patients should be treated with systemic antifungal medication until radiological resolution of the disease is observed.

71. **Transitioning the Spina Bifida Patient to an Adult Medical Home: The Jacksonville Experience**
Hector E. James, MD; David L. Wood, MD (Jacksonville, FL)
Introduction: In transitioning adolescents and young adults with spina bifida to an adult medical home, patients currently encounter multiple barriers including a lack of equivalent models to pediatric multidisciplinary clinics, a lack of knowledge amongst adult healthcare providers regarding patient needs, pervasive insurance coverage, and adult neurosurgeons that do not want to become the primary care physicians. We present a model based on our experience in transitioning patients from the Spinal Defects Clinic at Wolfson Children's Hospital to Jacksonville Health and Adult Transitional Services (Jax HATS), an adult medical home created for this purpose.
Methods: The Jax HATS structure is comprised of an Adult Medical Home Team that includes a Pediatrician, Internist, Nurse Coordinator, Unit Manager and Medical Social Worker. Upon reaching 18, patients in the Spinal Defects Clinic have a Transition Information Sequence prepared, which is provided to Jax HATS. Jax HATS then performs an intake, reviews the medical and insurance status, and then the Pediatrician and Internal Medicine Physician perform an evaluation. After identifying medical and social needs, the patient is referred to adult subspecialists or subspecialty care. The overall target is to maintain independence and self-care as well as to achieve a productive adult life.
Results: Since initiation in June 2004, the Spinal Defects Clinic has enrolled 70 families and has a preliminary experience of 16 patients transitioned to Jax HATS.
Conclusion: Patients with spina bifida may reach adulthood and require access to an adult medical home. We present a possible model that may be employed when there are no alternative venues.

72. **Increased Risk of Wound Infection with the Use of BioGlue**
Paul Klimo, MD, MPH; Amer Khalil, MD; Liliana C. Goumnerova, MD (Boston, MA)
Introduction: The use of various dural sealants have become common in neurosurgical practice. Recently, we began using a bovine albumin-glutaraldehyde combination called BioGlue. Ten patients who had this substance implanted have returned with wound complications.
Methods: A review of all clinical information was conducted on the ten patients who had BioGlue implanted and then returned with wound complications.
Results: There were 6 males and 4 females with an average age of 5.2 years (range, 11 months to 16 years). These 10 patients were part of 20 patients (50%) that had wound complications out of 1556 non-shunt related operations that were performed over the same time period in which BioGlue was being trialed. Spinal procedures were performed in 3 patients and craniotomies in 7. Six patients presented with purulent drainage from their wounds, 2 had periorbital cellulitis and 2 had swelling and fluctuance of their wounds. All patients were managed operatively by washout, debridement, and removal of the BioGlue, which was still present in all patients. They were then placed in intravenous antibiotics for varying durations. The average duration between the first surgery and the debridement was 12.5 wks (range, 2.5 to 28 weeks). Positive cultures were obtained in 7 patients. The cultures grew Staphylococcus species in 6 patients and Strep pneumonia in one.
Conclusions: We discourage the use of BioGlue in neurosurgical procedures as we feel that it has an associative and causative relationship with postoperative wound complications. We hypothesize that the pathogenesis involves the intense inflammatory response elicited by BioGlue.

73. **Choice of Surgical Revascularization in Childhood Moyamoya Angiopathy**
Nadia Khan, MD; Yasuhiro Yonekawa, MD (Zurich, Switzerland)
Introduction: Cerebral revascularization in childhood moyamoya angiopathy is extremely demanding. Awareness of presence of this disease, correct diagnosis, importance of cerebral revascularization along with choice of effective and successful revascularization procedure varies from place to place, i.e. country of patient origin, local surgical expertise and management-infrastructures available. We present our seven year experience of managing moyamoya patients, mainly children, from all across Europe, at the University hospital in Zurich, Switzerland.
Methods: Thirty-eight children were diagnosed with moyamoya angiopathy. These children (age 4 months to 15 yrs) were referred from local and other centers from all across Europe. Cerebral revascularization procedures were performed after thorough preoperative workup (clinical, CT/MRI, Doppler, angiography and H2150- PET studies).
Results: Multiple direct bypasses (STA-MCA: superficial temporal artery to branch of middle cerebral artery, STA-ACA: STA to branch of anterior cerebral artery) were performed depending on clinical presentation and region of cerebral perfusion reserve deficits on hemodynamic evaluation. Direct STA-MCA bypass was performed bilaterally in 34 patients and unilaterally in 3 patients. Additional direct STA-ACA bypass to augment frontal cerebral perfusion was performed in 12 patients. In 26 patients where the direct bypass method was technically not feasible indirect revascularization, dura- or arteriosynangiosis, was performed. Good clinical outcome was seen in all patients at an average of 6 months to 3 yrs follow-up.
Conclusions: Experience in cerebral revascularization using direct bypass technique is presented. Multiple direct bypasses (STA-MCA and STA-ACA)successfully augment regional cerebral perfusion. Additional indirect revascularization procedures help where the direct bypass presents technical limitations.

74. **Moyamoya Associated With Sickle Cell Disease: Outcome Following Surgical Revascularization**
Edward R. Smith, MD; Craig D. McClain, MD; R. Michael Scott, MD (Boston, MA)
Introduction: We present clinical and radiographic features of moyamoya syndrome in an operative series of patients with sickle-cell disease (SCD) to define features of moyamoya syndrome associated with SCD and determine the results of surgical revascularization at early and late follow-up.
Methods: Records of all patients with moyamoya syndrome associated with SCD in a consecutive series of patients who underwent pial synangiosis from 1985-2006 were reviewed.
Results: Of >200 treated patients, 8 had SCD: three females, five males. Average age at surgery was 12.8 years (range 5-22). All presented with ischemic symptoms, 100% with previous transient ischemic attacks and 5/8 with completed strokes. 7/8 patients had radiographic evidence of previous stroke at presentation. None presented with hemorrhage. Surgical treatment included pial synangiosis in all patients. Surgical complications included: one perioperative stroke and one perioperative pneumonia. Average length of stay was 7 days (including 24 hr preoperative admission for hydration). Average blood loss was 142 cc/hemisphere (n=13 hemispheres). Clinical and radiographic follow-up (average 31.8 months, range 6-96) demonstrated no worsening in neurologic status in any patient. No clinical or radiographic evidence of new infarcts were seen in any patient at late follow-up. Follow-up imaging (available in 4/8 patients) demonstrated good collateral development in 75% (3/4).
Conclusions: Clinical and radiographic features of moyamoya syndrome associated with SCD appear comparable to primary moyamoya disease. Operative treatment of moyamoya with pial synangiosis appears to be safe and confers long-lasting protection against further stroke in this population. This study underscores the potential merit of screening patients with SCD for moyamoya.

75. **Chorea in Association with Moyamoya Syndrome: Results of Surgical Revascularization and a Proposed Clinicopathological Correlation**
Edward S. Ahn, MD; Andrew E. Chapman; Edward R. Smith, MD; R. Michael Scott, MD (Boston, MA)
Introduction: Limited reports have linked moyamoya syndrome and chorea, mostly as isolated case studies, totaling 17 articles documenting 21 cases with the largest series being comprised of 3 patients. We present our experience with 10 patients with chorea and moyamoya disease.
Methods: A retrospective review of a consecutive series of 228 patients who underwent pial synangiosis revascularization for moyamoya disease from 1985-2006.
Results: Of 228 surgically treated moyamoya patients, 10 had chorea as part of their presentation (6 males, 4 females). Average age at surgical treatment was 12.4 years (range 5.6 - 29). Duration of chorea ranged from 2 months - 4 years in 9 patients prior to surgery. One patient developed a new onset of chorea three years

after surgery. 8/10 patients had evidence of hypertrophied lenticulostriate collateral vessels through the basal ganglia on pre-operative angiography and/or MRI. One patient had an infarct in the basal ganglia on pre-operative imaging. All patients underwent bilateral pial synangiosis. Follow-up was available in 9/10 patients (average 38.9 months). One patient developed chorea three years after surgical treatment, 4 patients had transient chorea that resolved prior to surgery, and 4 patients experienced resolution of the chorea after surgery.
Conclusion: This series substantially adds to the number of cases in which chorea and moyamoya syndrome are linked. Our data suggests that involvement of the basal ganglia by hypertrophied moyamoya collateral contributes to the development of chorea, which can wax or wane depending on disease stage or involution of the moyamoya collateral in response to revascularization surgery.

76. **The Spectrum of Cerebrovascular Anomalies Encountered in PHACES Syndrome**
Kurtis I. Auguste, MD; Brandon Davis, BA (San Francisco, CA); Denise Metry, MD (Houston, TX); Heather J. Fullerton, MD; Victor L. Perry, MD; Peter P. Sun, MD; Christopher Dowd, MD; Anthony Barkovich, MD; Ilona Frieden, MD (San Francisco, CA); Nalin Gupta, MD, PhD (San Francisco, CA)
Introduction: PHACES is a neurocutaneous syndrome characterized by posterior fossa abnormalities, hemangiomas of the face, arterial anomalies, cardiac/aortic arch defects, eye abnormalities and sternal defects. The cerebrovascular abnormalities encountered in PHACES patients are highly variable and the vascular pathology is incompletely understood.
Methods: We reviewed the magnetic resonance images and conventional angiograms of 41 children less than 12 years old who met the diagnostic criteria for PHACES syndrome.
Results: Thirty-five cerebrovascular anomalies were encountered in this group. The most common was hypoplasia of components of the anterior circulation which occurred in 16 patients (39%). Tortuous/redundant vessels occurred in 6 (15%), absent anterior circulation vessels in 3 (7%), persistent fetal circulation in 3 (7%), absent posterior circulation vessels in 2 (5%), and Circle of Willis anomalies in 2 (5%). Hypoplasia of posterior circulation vessels, a brainstem hemangioma and vessel fenestration were encountered in 3 separate patients (2% each).
Conclusions: Though variable, the cerebrovascular anomalies in PHACES appear to fall under the major categories of hypo-/aplasia, persistence of fetal vasculature and tortuousity/redundancy of major vessels. Detailed cerebrovascular imaging is recommended for all patients with PHACES syndrome.

100. **Cerebrospinal Fluid Diversion During Long-Term Invasive Electroencephalography Monitoring**
Matthew L. Miller, MD; Sean M. Lew, MD; Cheryl A. Muszynski, MD; Bruce A. Kaufman, MD (Milwaukee, WI)

101. **Surgical Treatment of Herniated Lumbar Disks in Children**
Sean McNatt, MD; Mark D. Krieger, MD; J. Gordon McComb, MD (Los Angeles, CA)

102. **MRI Findings in the Pediatric Klippel-Feil Population**
Rachana Tyagi, MD; Joseph Morreale, MD, Philadelphia, PA; James Guille, MD; Amer Samdani, MD (Philadelphia, PA)

103. **Multiphoton Imaging of Cerebral Microvascular Pulsatility and Cranial Compliance**
Bryan Bertoglio, MD; Alan Kay, PhD (Iowa City, IA)

104. **Endoscopic Filum Terminale Sectioning; Lessons and Limitations in a Cadaveric Feasibility Study**
Cuong Bui, MD; R. S. Tubbs, PhD, PA-C; Blake Pearson, MD; Leslie Acakpo-Satchivi, MD, PhD; Jefferey B. Blount, MD; Walter J. Oakes, MD; John C. Wellons, III, MD (Birmingham, AL)

105. **A Newly Described Entity: Glioneuronal Tumor with Leptomeningeal Dissemination**
Erica Zerfoss, BA; Mark D. Krieger, MD; Floyd Gilles, MD; Ignacio Gonzalez-Gomez, MD; Ira Bowen, BA; J. Gordon McComb, MD (Los Angeles, CA)

106. **Report of Intracranial Vasospasm with Subsequent Stroke After Subarachnoid Hemorrhage in 22 Month Old Child**
Manuel Ferreira, MD, PhD; Edward Ahn, MD; Kai U. Frerichs, MD; Mark Proctor, MD; Edward R. Smith, MD (Boston, MA)

107. **Diffusion Tensor Imaging and Tractography in Cerebellar Tumors: Preliminary Results**
Sudesh J. Ebenezer, MD; Savannah C. Partridge, PhD; Paul W. Richardson; Dennis W. Shaw, MD; Edward Weinberger, MD; Anthony M. Avellino, MD, FACS; Richard G. Ellenbogen, MD, FACS; Jeffrey G. Ojemann, MD, FACS (Seattle, WA)

108. **The Impact of Antibiotic Impregnated Catheters on Shunt Infection**
Caroline S. Hayhurst, MD; Donnacha F. O'Brien, MD; Neil Buxton, MD; Paul May, MD; Conor L. Mallucci, MD (Liverpool, United Kingdom)

109. **Analysis of the Chiari I Malformation Found in Children with Lipomyelomeningocele: A Radiological and Anatomical Study**
Cuong Bui, MD; Richard S. Tubbs, PhD, PA-C; Blake Pearson, MD; Leslie J. Acakpo-Satchivi, MD, PhD; John C. Wellons, III, MD; Jeffferey B. Blount, MD; Walter J. Oakes, MD (Birmingham, AL)

100. **Cerebrospinal Fluid Diversion During Long-Term Invasive Electroencephalography Monitoring**
Matthew L. Miller, MD; Sean M. Lew, MD; Cheryl A. Muszynski, MD; Bruce A. Kaufman, MD (Milwaukee, WI)
Introduction: Cerebrospinal fluid (CSF) leakage is associated with an increased risk of infection. Long-term invasive electroencephalography (EEG) with subdural electrodes carries an increased risk of CSF leakage due to tracking of fluid along the electrodes to the exterior. We report a series of patients in which CSF diversion was employed, reducing the incidence of CSF leakage and, presumably, reducing the risk of infectious complications.
Methods: Information regarding fifteen pediatric patients age 5 y - 16 y who underwent invasive epilepsy monitoring is reported. All patients had subdural electrodes and one of the following drains: ventriculostomy (3), subdural drain (1), epidural drain (9), or subgaleal drains (2). All electrodes were individually tunneled to separate exit sites on the scalp.
Results: A total of 109 days (in 15 patients) of invasive monitoring with CSF diversion were reviewed. CSF leakage occurred in one patient (6.7%) which resolved by increasing the CSF drainage. One subdural hematoma occurred requiring evacuation (the patient had a subgaleal drain). One infection occurred requiring debridement and long-term antibiotics. The average duration of invasive monitoring was 7.27 days. Our strategy has evolved to the exclusive use of epidural drainage; we have had no occurrences of leakage or clinically significant bleeding since instituting this algorithm.
Conclusion: CSF diversion during invasive epilepsy monitoring is safe, simple and effective at preventing CSF leakage from tunneled electrodes.

101. **Surgical Treatment of Herniated Lumbar Disks in Children**
Sean McNatt, MD; Mark D. Krieger, MD; J. Gordon McComb, MD (Los Angeles, CA)
Introduction: Symptomatic lumbar disk herniations occur infrequently in the pediatric population. Clinical characteristics and outcomes in this population are not well established.
Methods: We reviewed our experience with the surgical treatment of these lesions during the past ten years. Patients were identified that underwent microscopic lumbar diskectomy for herniated nucleus pulposis between 1997and 2006. Medical records were reviewed in their entirety. Variables analyzed included presenting signs/symptoms, precipitating events, level(s) involved, location of disk, presence of coexisting disk degeneration or vertebral column abnormalities, findings at surgery, and postoperative clinical response including recurrence.
Results: Twenty-five children underwent a total of twenty-six operations for lumbar herniated disk(s) during the study interval. Patients with complete clinical data were analyzed. Mean age at surgery was 16.3 years,with a median of 17 years. All reported mechanical low back pain, while 91% had radicular symptoms. 58% presented with lower extremity motor weakness, and none had significant bowel or bladder disturbance. 75% of patients reported acute onset of pain during or immediately following sports-related or other traumatic injury. 30% of patients had two-level disease. Conservative measures were prescribed an average of 6months before recommending surgical therapy (range 3 days to 1 year). All patients were treated via unilateral or bilateral hemilaminotomy and microscopic diskectomy with or without foraminotomy. All patients reported dramatic symptomatic improvement postoperatively. No operative complications occurred. 12% patients experienced clinically and radiographically significant recurrent disk herniations during the study interval, one of which required surgical intervention.
Conclusions: Ediatric herniated lumbar disks commonly present as a result of sports-related injury. Multilevel disk herniations are surprisingly common in this cohort. Early outcomes are promising, but long term follow-up will be informative.

102. **MRI findings in the Pediatric Klippel-Feil Population**
Rachana Tyagi, MD; Joseph Morreale, MD, Philadelphia, PA; James Guille, MD; Amer Samdani, MD (Philadelphia, PA)
Introduction: Although Klippel-Feil is a fairly common syndrome and most often asymptomatic, certainly some cases are associated with neurologic symptoms and abnormalities requiring treatment. This study aims to elucidate the incidence of intraspinal abnormalities in the pediatric patient population, and to identify characteristics that would indicate the need for further imaging studies to evaluate for the possibility of such findings.
Methods: The medical records of patients with diagnoses of Klippel-Feil and congenital spinal anomalies from 1990-2005 were reviewed from our institution. Thirty-seven patients with segmentation abnormalities of the cervical spine qualifying them with Klippel-Feil were identified. The medical records were then reviewed for patient characteristics, associated syndromes, imaging studies, surgical interventions and physical exam findings.
Results: Of the 37 patients, 20 had an MRI obtained for various indications. Only 6 (30%) had a significant abnormality identified on MRI involving either the posterior fossa or the cervical cord. Minor MRI abnormalities were noted in 6 (30%) , including foraminal stenosis, disc degeneration or mild Chiari malformation. The physical exam identified a neurologic abnormality in only 3 of the 20 patients (15%).
Conclusions: Most Klippel-Feil patients do not have any neurologic deficits or intraspinal abnormalities that would require any further interventions. The decision to obtain an MRI to visualize the cord should be driven by abnormal findings on exam, or the need to perform a surgical intervention which could put an asymptomatic cord at risk.

103. **Multiphoton Imaging of Cerebral Microvascular Pulsatility and Cranial Compliance**
Bryan Bertoglio, MD; Alan Kay, PhD (Iowa City, IA)
Introduction: The pathophysiology of hydrocephalus remains enigmatic after a century of research. Several currently proposed theories predict alterations in cerebrovascular pulsatility at the microvascular level. Nevertheless, the degree of pulsatility present in normal microvasculature and the effect of altered cranial compliance have not been described experimentally.
Methods: We have employed laser scanning two-photon microscopy in live mice to measure microvascular velocities transcranially with high spatial and temporal resolution. Anesthetized mice were mounted under the objective of an upright microscope. Blood vessels of the neocortex were imaged through thinned calvarium after the intravascular injection of quantum dots. Vessels ranging from pial arterioles to parenchymal capillaries were imaged.
Results: Direct observation of flow in cortical vasculature was demonstrated with and without alteration of cranial compliance. The degree of increase in intracranial compliance was found to directly correlate with the amount of thinning of the calvarium through which imaging occurs. Cardiosynchronous pulsatility was demonstrated in normal vessels and co-varied with increased compliance.
Conclusions: These results suggest that consideration of compliance is critical to the interpretation of in vivo cerebrovascular experimental data. They also support the interplay between hemodynamics and cranial compliance. Further application of this technique may provide insight into the pathophysiology of hydrocephalus and allow direct testing of pulsatility based theories.

104. **Endoscopic Filum Terminale Sectioning; Lessons and Limitations in a Cadaveric Feasibility Study**
Cuong Bui, MD; R. S. Tubbs, PhD, PA-C; Blake Pearson, MD; Leslie Acakpo-Satchivi, MD, PhD; Jefferey B. Blount, MD; Walter J. Oakes, MD; John C. Wellons, III, MD (Birmingham, AL)
Introduction: Intraspinal endoscopy has a published history limited mostly by technology and applicability. With advances in fiberoptic and lighting technology, endoscopes have become smaller and more clinically adoptable. Combining experience with open surgical filum terminale sectioning with midline trans-ligamentum flavum as well as trans-sacral hiatus approaches, we have performed a cadaveric pilot study.
Methods: Five formalin-fixed adult cadavers and one fresh adult cadaver were utilized. A rigid 1.1 mm endoscope as well as a flexible 2.8 mm neurofiberscope were used. Toughy needles, epiduroscopy percutaneous introduction sets, and open dissection techniques as methods of access into the thecal sac were evaluated and used.
Results: Currently, access into the thecal sac was easier using a Toughy needle and 1.1 mm endoscope in a lumbar puncture-type approach. Visualization was adequate for structure identification. Limitations included the absence of a working channel, restricted navigation ability, and the dorsal position of the cadaveric non-pathologic filum. Visualization was excellent using the flexible endoscope through the sacral hiatus. Navigation improved significantly but became somewhat more restricted when an instrument was present in the working channel. Identification of the filum was easier when tracing it inferiorly from the conus medullaris. Access into the epidural space from the hiatus became easier with practice, but into the thecal sac was limited by instrumentation.
Conclusions: Pathologic filum terminale sectioning is a well established open procedure. Intraspinal endoscopy is rapidly progressing in its technological advances. Continued cadaveric and IRB-approved surgical studies will assist in evaluating the role of endoscopy in this pathologic entity.

105. **A Newly Described Entity: Glioneuronal Tumor with Leptomeningeal Dissemination**
Erica Zerfoss, BA; Mark D. Krieger, MD; Floyd Gilles, MD; Ignacio Gonzalez-Gomez, MD; Ira Bowen, BA; J. Gordon McComb, MD (Los Angeles, CA)
Introduction: Mixed glioneuronal tumors (GNTs) do not easily fall into a World Health Organization (WHO) classification for CNS tumors. Due to the rarity and lack of long-term follow-up of patients with these newly recognized entities, it is unclear if these tumors represent a single entity or a heterogeneous group belonging to many diagnostic categories.
Methods: This IRB-approved study retrospectively reviewed three children treated for a mixed GNT whose distinct morphological features are not included in a precise WHO classification. Pathology slides were reviewed for ultrastructural characteristics and immunohistochemical staining results. Clinical course was also reviewed.
Results: Three children with diagnostically challenging mixed GNTs that exhibited extensive leptomeningeal dissemination. The leptomeningeal tumor invaded the cerebellum (2 cases) and spinal cord (1 case). Magnetic resonance imaging (MRI) revealed leptomeningeal enhancement of the spinal cord and brain and multiple cystic regions. Biopsy in all cases revealed thickened, fibrotic meninges and tumor exhibiting a mixed glioneuronal phenotype. Two cases showed progression and were treated with chemotherapy. One patient died. There are four factors that, together, describe this tumor as a unique entity: 1) The anatomic location in the leptomeninges without parenchymal involvement, 2) The pathology of a monotonous small round cell tumor with fine chromatin, 3) Tumor cells showing mixed glial and neuronal differentiation based on immunohistochemistry and ultrastructural morphology, 4) Leptomeningeal enhancement on MRI images mimicking an infectious etiology.
Conclusions: While all three cases exemplify varying degrees of glial and neuronal cell differentiation and clinical aggressiveness, we believe they collectively represent a distinct pathological entity that cannot currently be placed into the WHO classification of CNS tumors.

106. **Report of Intracranial Vasospasm with Subsequent Stroke After Subarachnoid Hemorrhage in 22-Month Old Child**
Manuel Ferreira, MD, PhD; Edward Ahn, MD; Kai U. Frerichs, MD; Mark Proctor, MD; Edward R. Smith, MD (Boston, MA)
Introduction: Clinical and radiographic evidence of vasospasm is rare in children after subarachnoid hemorrhage (SAH) and has not been reported in infants. We report a 22-month old child presenting with traumatic SAH who subsequently developed clinically symptomatic vasospasm. To our knowledge, this is the first report of vasospasm associated with SAH in a child this young.
Methods: Case report.
Results: A 22-month old boy fell and had dense SAH. Evaluation for occult vascular lesions was unremarkable and normal vessel caliber was noted, along with known longstanding ventriculomegaly. Ten days later, left-sided weakness developed and a right MCA infarct was identified. Evaluation disclosed significant vasospasm. This diagnosis is supported by computed tomography angiography (CTA), Doppler ultrasonography, magnetic resonance imaging (MRI) and conventional angiography. The child was treated with intra-arterial verapamil with good result, as well as with conventional intensive care measures to reduce vasospasm.
Conclusions: This report documents the first known case of vasospasm with stroke after SAH in a patient under the age of 2 years. This finding is important because it demonstrates that the entity of SAH-associated vasospasm can affect the very young, increasing the spectrum of ages susceptible to this condition. It is also important because is demonstrates that even very young children can respond to conventional therapeutic interventions, such as intra-arterial verapamil. This case suggests, contrary to conventional wisdom, that even very young children can develop symptomatic vasospasm after SAH. As such, clinicians need to be alert to the possibility of vasospasm as a potential diagnosis when evaluating young children with SAH.

107. **Diffusion Tensor Imaging and Tractography in Cerebellar Tumors: Preliminary Results**
Sudesh J. Ebenezer, MD; Savannah C. Partridge, PhD; Paul W. Richardson; Dennis W. Shaw, MD; Edward Weinberger, MD; Anthony M. Avellino, MD, FACS; Richard G. Ellenbogen, MD, FACS; Jeffrey G. Ojemann, MD, FACS (Seattle, WA)
Introduction: Diffusion tensor imaging (DTI) allows visualization of orientation, location, and anisotropy of the brain's white matter tracts. Tractography then estimates paths of connections from a seed point, demonstrating afferent and efferent pathways. We report preliminary results with DTI of cerebellar-thalamic pathways in controls and patients with cerebellar lesions.
Methods: DTI was performed on controls, and on 3 patients with cerebellar lesions (2 midline, 1 lateral) using 1.5T Siemens. Fiber tracking used cerebellar nuclear regions and pons as seed points, identifying both cerebello-thalamic and cerebello-pontine fibers.
Results: In control subjects and in the lateral lesion, the cerebello-thalamic

pathway was tracked from the medial nuclear region to thalamus. The pathway leaves the cerebellar nuclei to occupy the most medial cerebellum, at the boundary of the fourth ventricle. This position is medial to the AP-oriented cerebello-pontine fibers. In patients with midline tumors, the cerebello-thalamic tract was not evident. The cerebello-pontine fibers were laterally displaced, and tumor abutted these tracts in the location where the cerebello-thalamic tract was identified in the other groups.
Conclusions: Cerebellar pathways can be tracked in control and patient populations. The cerebello-thalamic tract lies medially within the cerebellar peduncles and may be difficult to track in the setting of fourth ventricular tumors. The medial location of these tracts may make them prone to damage and provide an alternative hypothesis for the origin of posterior fossa mutism, rather than vermian splitting. DTI studies of the cerebellum in this and other populations may reveal clues to cerebellar functional anatomy and guide future surgical techniques.

108. **The Impact of Antibiotic Impregnated Catheters on Shunt Infection**
Caroline S. Hayhurst, MD; Donnacha F. O'Brien, MD; Neil Buxton, MD; Paul May, MD; Conor L. Mallucci, MD (Liverpool, United Kingdom)
Introduction: Infection remains a major problem with CSF diversion procedures. Antibiotic impregnated shunt (AIS) catheters have been introduced to prevent infection, mainly in the early postoperative period when most infections occur. We evaluate the impact on reducing infection rates in clinical practice following the introduction of catheters impregnated with clindamycin and rifampicin (Bactiseal™, Codman).
Methods: A retrospective analysis of all shunt procedures undertaken after the introduction of AIS systems. A total of 178 procedures were identified where a complete AIS system was implanted between October 2003 and December 2004. This includes 74 adults and 71 children. The mean follow-up is 17.9 months. For the purposes of analysis shunt procedures where classified as de novo, non-infected revision shunts or post-external drainage to assess variation in infection rates.
Results: In the de novo shunt subgroup for both children and adults there were no infections. In the paediatric population there were 10 infections in total, 7 (25%) post external ventricular drainage and 3 (7.5%) in revision cases. There were a total of 3 (3.61%) infections in adult shunt procedures, all in patients with prior external ventricular drains.
Conclusions: AIS catheters have reduced the number of CSF shunt infections overall, although the majority continue to occur in children. In the setting of de novo shunts the outcome is excellent. This has had a significant impact on the neonatal hydrocephalic population. Gram positive organisms continue to predominate. The high risk of shunt infection after a period of external ventricular drainage raises issues of the development of bacterialresistance.

109. **Analysis of the Chiari I Malformation Found in Children with Lipomyelomeningocele: A Radiological and Anatomical Study**
Cuong Bui, MD; Richard S. Tubbs, PhD, PA-C; Blake Pearson, MD; Leslie J. Acakpo-Satchivi, MD, PhD; John C. Wellons, III, MD; Jeffferey B. Blount, MD; Walter J. Oakes, MD (Birmingham, AL)
Introduction: Patients with Lipomyelomeningocele (LMM) and a concomitant Chiari I malformation (CIM) are rare. We report our higher than expected incidence of patients with the simultaneous occurrence of these entities and explore possible mechanisms for this association.
Methods: We did retrospectively analysis of 54 patients with LMM. Posterior fossa volumetrics were performed on all patients with a CIM. In fresh cadavers (n=12) with no CIM, distal tension (75 N) was applied to the conus with simultaneous observation of the posterior neural elements caudal movement/displacement.
Results: 7 of 54 patients (13%) were found to have a CIM. No correlation was found between the amount of hindbrain herniation and the level of the conus or the type of LMM. Volumetric studies revealed normal age-matched volumes in all but one patient. Caudal tension on the cord in the cadavaric studies demonstrated negligible movement of the tonsils and cervical cord.
Conclusions: The incidence of CIM in the LMM populations appears to be significantly greater than previously reported. Although the pathogenesis of such association is unclear, our findings in the cadaveric model suggest that it is unlikely to be due to caudal fixation of the distal spinal cord with resultant inferior displacement of the tonsils. Decreases in the volume of the posterior cranial fossa were also not found. Therefore a cause and effect for the concomitant occurrence of LMM and CIM remains elusive. The clinician may wish to image the entire neural axis in patients with LMM and potentially consider an additional etiology for syringes found in this group.

110. **Intraventricular Hemorrhage in Premature Infants at CHEO**
Michael Vassilyadi, MD, FRCSC; Zachary Tataryn; Simon Dagenais, PhD; Marc Blayney, MD, FRCSC; Enrique C.G. Ventureyra, MD, FRCSC (Ottawa, Ontario, Canada)

111. **Familial Clustering of Chiari 1 Malformation with Associated Syringomyelia**
Vishal Kakar, MBBS, FRCS; James Weisfeld-Adams, MBBS, BSc; Michael Carter, MBBS, FRCS (Bristol, United Kingdom)

112. **Influence of Silicone Surface Roughness and Hydrophobicity on Bacterial Adhesion and Colonization**
Haiying Tang, BS; Xuemei Liang, PhD; Ting Cao, BS; Steven O. Salley, PhD; James P. McAllister, PhD; K.Y. Simon Ng, PhD (Detroit, MI)

113. **Noval Approach for Resection of Trigeminal Schwannoma: Technical Report for Use of the Paraoccipital Interhemispheric Transtentorial Approach**
Ramin J. Javahery, MD; J. Gordon McComb, MD (Los Angeles, CA)

114. **West Nile Virus Encephalitis in a Child With Shunted Hydrocephalus**
Craig Berg, BS; Chris S. Karas, MD; Scott W. Elton, MD, (Columbus, OH)

115. **Intraorbital Soft Tissue Glomus Tumor in an 8 Year Old Child: Presentation and Management**
Todd C. Hankinson, MD; Alfred Ogden, MD; Peter Canoll, MD, PhD; James Garvin, MD; Michael Kazim, MD; Jeffrey Bruce, MD; Neil Feldstein, MD; Richard Anderson, MD (New York, NY)

116. **Combined Petrosal Approach: Technique and Applications in Pediatric Neurosurgery**
Samuel R. Browd, MD, PhD; William T. Couldwell, MD, PhD; Marion L. Walker, MD (Salt Lake City, UT)

117. **Neuropsychologic Outcome After Endoscopic Third Ventriculostomy in Children With Primary Brain Tumors and AcqueductalStenosis**
Liliana C. Goumnerova, MD, FRCSC; Nicole Ullrich, MD, PhD; Celiane Rey-Casserly, PhD (Boston, MA)

118. **Surgical Options in the Treatment of Atypically Presenting Giant Craniopharyngiomas in Young Children**
Cuong Bui, MD; Leslie J. Acakpo-Satchivi, MD, PhD; R. S. Tubbs, PhD, PA-C; Audie Wooley, MD; Jefferey B. Blount, MD; Walter J. Oakes, MD; John C. Wellons, III, MD (Birmingham, AL)

119. **Are Nasal "Lymphatic" Pathways Alternative Sites of CSF Absorption in the H-Tx Rat?**
Jogi V. Pattisapu, MD; Mohammad Nabiuni, PhD; Mohamed Gharnit; Leena Paul, MA (Orlando, FL)

120. **Diagnostic Yield of Standard CT Scans in Diagnosis of Chiari Malformation in Pediatric Population**
Mirza Baig, MD, PhD; Moumen Asbahi, BS; Scott Elton, MD (Columbus, OH)

121. **Multimodality Treatment of Pediatric Cerebral Aneurysms**
Gregory G. Heuer, MD, PhD; Michael F. Stiefel, MD, PhD; Riyadh Al-Okaili, MD; Anuj Basil, BS; Suresh Magge, MD; Linda Bagley, MD; John B. Weigele, MD, PhD; Leslie N. Sutton, MD; Robert W. Hurst, MD; Phillip B. Storm, MD (Philadelphia, PA)

122. **Chiari 1.5 Malformation Masquerading as Lumbar Radiculopathy**
Ilya Laufer, MD; Murray Engel, MD; Mark M. Souweidane, MD (New York, NY)

123. **The Use of a Peal Away Introducer Sheath for Distal Catheter of a Ventriculoperitoneal Shunt**
William J. Thoman, MD; Edward J. Kosnik, MD (Columbus, OH)

124. **Variations in Surgical Technique to Aid in Placement of the Peritoneal Shunt Catheter**
Mirza Baig, MD, PhD; Moumen Asbahi, BS; Chris Karas, MD Edward Kosnik, MD (Columbus, OH)

125. **Effects of Tumor Laterality on Parent- and Child-Reported Quality of Life in Pediatric Brain Tumor Patients**
Zarui Melikyan, PhD (Hershey, PA); Leslie J. Kim-Cunningham, PhD (Boston, MA); Elias Risk, MD; Jonas Sheehan, MD, FACS; Elana Farace, PhD (Hershey, PA)

126. **Bandages, Dressings and Cranial Neurosurgery**
Ken Winston, MD (Denver, CO); Lori A. McBride, MD (New Orleans, LA); Anwar Dudekula, MD (Denver, CO)

127. **A Multi-Modality Frontal Approach to the Fourth Ventricle in a Case of Loculated Hydrocephalus**
Chris S. Karas, MD; David Gonda, BS; Scott W. Elton, MD (Columbus, OH) ventricular catheterization in the setting of ventricular distortion.

128. **Aggressive Variant of Papillary Glioneuronal Tumor**
Ramin J. Javahery, MD; J. Gordon McComb, MD; Laurence Davidson, MD; Ignacio Gonzalez, MD (Los Angeles, CA)

129. **Successful Microsurgical Extraction of a Migrated Coil After Failed Endovascular Closure of a Blalock-Taussig Shunt**
Gregory G. Heuer, MD, PhD; Kareem A. Zaghloul, MD PhD; Roberts Richard, MD; Michael F. Stiefel, MD, PhD; Phillip B. Storm, MD (Philadelphia, PA)

130. **Development of 'Tunable' Rifampicin-Impregnated Silicone Catheters Using Polymer Coatings**
Xuemei Liang, PhD; Haiying Tang, BS; Anfeng Wang, PhD; Ting Cao, BS; Steven O. Salley, PhD; James P. McAllister, PhD; K.Y. Simon Ng, PhD (Detroit, MI)

110. **Intraventricular Hemorrhage in Premature Infants at CHEO**
Michael Vassilyadi, MD, FRCSC; Zachary Tataryn; Simon Dagenais, PhD; Marc Blayney, MD, FRCSC; Enrique C.G. Ventureyra, MD, FRCSC (Ottawa, Ontario, Canada)
Introduction: Intraventricular hemorrhage (IVH) is the most common neonatal intracranial hemorrhage and the incidence is directly related to the degree of prematurity. Although more premature infants are surviving with a decrease in the severity of IVH, there have been no changes in neurodevelopmental handicaps.
Methods: The charts of 360 neonates with IVH born between 1990 and 2005 were retrospectively reviewed. Of these, 297 were identified as premature infants. The IVH grading was based on head ultrasound reports.
Results: There was a male preponderance in all IVH grades with grade 1 representing almost half the cases (48%) and the remaining three grades almost equally represented (19%, 14%, 19%). Mortality rate was 19% and 70% of these were patients with grade 4 IVH. Hydrocephalus occurred in 21% of the premature infants, and of these 39% required shunting. Long-term outcome information was extracted in 272 patients that had adequate information in the chart with a mean follow-up of 6.5 years. Good outcome was almost equally distributed in grades 1-3 (85%, 72%, 75%) and bad outcome was predominately in the grade 4 cases (86%).
Conclusions: Hydrocephalus is only one sequela of many others in premature infants and may not be as important in contributing towards the long-term outcome handicaps. This is especially evident since grade 2 and grade 3 IVH patients were found to have similar outcomes. Grade 4 IVH may represent a different entity and may require sub classification in order to allow prediction of the few patients that have a better outcome.

111. **Familial Clustering of Chiari 1 Malformation with Associated Syringomyelia**
Vishal Kakar, MBBS, FRCS; James Weisfeld-Adams, MBBS, BSc; Michael Carter, MBBS, FRCS (Bristol, United Kingdom)
Introduction: A genetic basis for Chiari I malformation with associated syrinx (CMI/S) has been implied from pedigree analysis of familial clusters and twin studies. In addition, association with other inherited conditions further suggests a genetic basis in some cases.
Methods: We present the first familial cluster with 3 affected siblings.
Results: Two daughters of non-consanguineous parents aged 15 and 14 presented with suboccipital headaches, otoneurologic symptoms, hindbrain compression and peripheral sensory deficits consistent with CMI/S. MRI revealed tonsillar descent of 20mm and marked platybasia in both. Medullary kink was observed in one and retroflexed odontoid process in the other. Both also had a cervicothoracic syrinx. A third sister aged 18 was asymptomatic but screening MRI revealed tonsillar descent to the arch of C1, CSF restriction at the Foramen Magnum and mild platybasia. A fourth sister and the father were clinically and radiologically normal. The mother had a long history of cough headaches and left arm sensory disturbance, but otherwise asymptomatic. MRI revealed mild platybasia without tonsillar descent. All 6 family members had a normal karyotype.
Conclusions: Most patients with CMI/S have extensive bony abnormalities of the posterior fossa and base of skull. All 4 siblings and their mother had varying degrees of platybasia in this series, which may be the primary inherited abnormality. Platybasia is a recognized feature in inherited conditions such as Osteogeneis Imperfecta. Understanding a genetic cause of CMI/S in a subset of patients is important for counseling and timely diagnosis of close relatives and alerts to identifying associated conditions in affected individuals.

112. **Influence of Silicone Surface Roughness and Hydrophobicity on Bacterial Adhesion and Colonization**
Haiying Tang, BS; Xuemei Liang, PhD; Ting Cao, BS; Steven O. Salley, PhD; James P. McAllister, PhD; K.Y. Simon Ng, PhD (Detroit, MI)
Introduction: Bacterial adhesion and colonization are complicated processes that involve many factors, including surface chemistry, hydrophobicity and surface roughness, but the roles of these factors are not clear. The objective of this study was to modify hydrophobicity and roughness on one polymeric surface, and measure the corresponding bacterial adhesion and colonization changes.
Methods: One- and two-dimensional mechanically-assembled (stretched) monolayer (MAM) methods were used to enhance hydrophobicity of fluoroalkylsilane (FAS) coatings on silicone. Surface roughness was varied with different abrasives. Surface hydrophobicity and roughness were determined by contact angle measurement and atomic force microscopy, respectively. Bacterial adhesion and colonization were quantified using scanning electron microscopy and direct colony-counting.
Results: Hydrophobicity increased as a function of stretched length or width ($\triangle x$); it reached a maximum at $\triangle x = 60\%$ with one- and two-dimensional MAM and decreased as $\triangle x$ increased to 80% and 100%. After 12 hr incubation, all of FAS/silicone surfaces significantly reduced the adherence of Staphylococcus epidermidis from 42% to 88% compared to untreated silicone. Moreover, bacterial adhesion as a function of $\triangle x$ had an opposite trend, i.e. when hydrophobicity increased bacterial adhesion decreased and vice versa. Surface roughness had a significant effect on bacterial adhesion and colonization when the root-mean-square roughness was higher than 200nm.
Conclusion: On FAS/silicone surfaces, bacterial adhesion was reduced significantly, and was inversely related to surface hydrophobicity. Moreover, a rougher surface promoted bacterial adhesion and colonization; however, there is a certain threshold (200nm) below which there was no significant decrease in bacterial adhesion and colonization.

113. **Noval Approach for Resection of Trigeminal Schwannoma: Technical Report for Use of the Paraoccipital Interhemispheric Transtentorial Approach**
Romin J. Javahery, MD; J. Gordon McComb, MD (Los Angeles, CA)
Introduction: Trigeminal Schwannoma's are rare tumors in children with only 10 cases reported. These tumors have been categorized as occupying the middle fossa (Type A), posterior fossa (B), both (C), or extracranial (D). Surgical resection of these tumor has been a surgical challenge.
Methods: We present a retrospective review of the surgical management of two children with Type C tumors managed at Children's Hospital Los Angeles. Their clinical histories, operative reports, and imaging studies were reviewed.
Results: Patient 1 is an 11 year-old girl with incidentally found bilateral papilledema and mild right-sided hearing loss. Her examination was normal except for the right-sided hearing loss and papilledema. Patient 2 is an 11 year-old boy with a 5 year history of worsening imbalance and drooling. His examination revealed mild papilledema, loss of left-sided facial sensation, diminished left-sided palatal elevation, left-sided dysmetria, and a positive Romberg sign. Their imaging studies revealed large dumbbell shaped trigeminal schwannomas with brain stem compression extending into Meckel's cave in patient 1 and cavernous sinus in patient 2. Both patients underwent a paraoccipital interhemispheric transtentorial approach for gross total resection in patient 1 and partial resection in patient 2. Post-operatively, patient 1 had transient left homonymous hemianopsia and trochlear nerve palsy. Her hearing improved subjectively. She had moderate loss of facial sensation mainly in the V2 distribution. Clinical outcome in patient 2 is still pending.
Conclusions: A safe and effective resection of trigeminal schwannomas is possible via a transtentorial approach without an extensive skull base dissection.

114. **West Nile Virus Encephalitis in a Child With Shunted Hydrocephalus**
Craig Berg, BS; Chris S. Karas, MD; Scott W. Elton, MD (Columbus, OH)
Introduction: The differential diagnosis of viral encephalitis in a child is extensive. Most commonly the offending agent is an enterovirus, accounting for 85-95% of all cases. Arboviruses are another rare cause of viral encephalitis, and are commonly introduced to the host through an arthropod vector. This last group of viruses includes the Saint Louis encephalitis virus, the Western and Eastern equine encephalitis viruses, West Nile virus, and the California encephalitis viruses. Young children under the age of five appear to be more susceptible to this final group of pathogens than the rest of the population, especially in the Midwestern United States, where many of these agents are endemic.
Methods: We report a case of West Nile virus encephalitis diagnosed in a patient with shunted hydrocephalus. A six-year old female with a ventriculoperitoneal shunt placed in infancy for congenital hydrocephalus presented with nausea, headaches and lethargy. Initial work-up for shunt dysfunction was negative. Further testing, including CSF sampling from the shunt itself, revealed immunologic changes consistent with acute West Nile virus infection.
Results: The patient was treated supportively, as per routine for West Nile virus infection, and recovered completely without surgical intervention.
Conclusion: This is the first reported case of immunoassay-proven West Nile virus encephalitis in the setting of ventriculoperitoneal shunting. Of particular importance in this case was the ability to treat this patient's infection expectantly without shunt revision or externalization.

115. **Intraorbital Soft Tissue Glomus Tumor in an 8 Year Old Child: Presentation and Management**
Todd C. Hankinson, MD; Alfred Ogden, MD; Peter Canoll, MD, PhD; James Garvin, MD; Michael Kazim, MD; Jeffrey Bruce, MD; Neil Feldstein, MD; Richard Anderson, MD (New York, NY)
Introduction: Glomus tumors of the soft tissue are unrelated to neuroendocrine paragangliomas (glomus tympanicum, jugulare and vagale), with which neurosurgeons, neuropathologists, and head and neck surgeons are familiar. As such, these specialists are unaccustomed to managing these lesions.
Methods: An 8 year-old girl presented with right eye blindness, rapidly progressing proptosis, and a sixth nerve palsy. MRI demonstrated a homogenously enhancing lesion extending from the right orbit through the superior orbital fissure to the cavernous sinus. Transorbital biopsy demonstrated a soft tissue glomus tumor. Angiography and embolization were followed by a single-piece pterional craniotomy with orbitozygomatic osteotomy. Gross total resection was achieved. The patient recovered uneventfully.
Results: Pathology was again consistent with soft tissue glomus tumor. The patient underwent Proton Beam Radiotherapy at an outside institution. At six months follow-up, her proptosis and sixth nerve palsy have resolved. MRI demonstrates no evidence of recurrence.
Conclusions: Soft Tissue Glomus Tumors are derived from the Glomus Bodies, which are specialized arteriovenous shunts that serve a thermoregulatory function and are concentrated in the distal extremity dermis. Glomus Tumors have been identified in the GI and GU tracts, bone, nasopharynx, and other sites. To our knowledge, this is the first case of a Glomus Tumor presenting in the orbit and the second with an intracranial component. Although soft tissue Glomus Tumors in atypical locations are less predictable than those in common locations, surgical excision is generally curative. As such, accurate diagnosis of this rare lesion is imperative, as it may spare the patient the need for adjuvant therapy.

116. **Combined Petrosal Approach: Technique and Applications in Pediatric Neurosurgery**
Samuel R. Browd, MD, PhD; William T. Couldwell, MD, PhD; Marion L. Walker, MD (Salt Lake City, UT)
Introduction: The combined petrosal approach is typically utilized for enhanced petroclival exposure especially in the area of the petroclival junction, middle clivus, apical petrous bone, posterior cavernous sinus, and Meckel's cave.
Methods: We utilized the combined petrosal approach to resect a ganglioglioma involving the right posterior temporal lobe extending to the tentorial incisura, quadrigeminal cistern and posterior fossa.
Results: Skull base techniques provide direct access to complex lesions with the benefit of reduced brain retraction.
Conclusions: The combined petrosal approach will be discussed in detail and several pediatric cases will be reviewed where this approach was beneficial.

117. **Neuropsychologic Outcome After Endoscopic Third Ventriculostomy in Children With Primary Brain Tumors and Acqueductal Stenosis**
Liliana C. Goumnerova, MD, FRCSC; Nicole Ullrich, MD, PhD; Celiane Rey-Casserly, PhD (Boston, MA)
Introduction: Endoscopic third ventriculostomy (ETV) is an effective technique for the treatment of obstructive hydrocephalus. The purpose of this study was to determine the neuropsychologic sequelae of ETV in children with primary brain tumors and aqueductal stenosis.
Methods: We retrospectively reviewed all cases of children who underwent ETV for hydrocephalus at our institution and who had undergone neuropsychologic testing.
Results: A total of 23 patients were evaluated. Neuropsychological outcomes varied widely in the group; overall IQ ranged from 62 to 129 with a mean of 94. Assessment of verbal learning was available for 17 of the patients and scores were lower than average in the group. Significant verbal learning problems were seen in a substantial number of patients: 35% scored at or below 1.5 standard deviations in word list learning and 65% scored at or below 1.5 standard deviations on delayed recall of verbal information. Those patients who had received additional adjuvant therapy performed similarly to the patients who did not with respect to IQ, but memory scores were somewhat lower for patients receiving adjuvant therapy.
Conclusions: Post surgical performance in our patient population ranged widely from significantly impaired to well above average. Verbal memory problems appear more prevalent in our patients overall and there is evidence that patients without additional adjuvant therapy showed milder deficits in verbal memory. These results suggest that ETV is relatively safe in terms of long-term cognitive sequelae but that a subset of patients may be at more risk for unwanted neuropsychologic side effects.

118. **Surgical Options in the Treatment of Atypically Presenting Giant Craniopharyngiomas in Young Children**
Cuong Bui, MD; Leslie J. Acakpo-Satchivi, MD, PhD; R. S. Tubbs, PhD, PA-C; Audie Wooley, MD; Jefferey B. Blount, MD; Walter J. Oakes, MD; John C. Wellons, III, MD (Birmingham, AL)
Introduction: Giant craniopharyngiomas pose a formidable therapeutic challenge, particularly in young children. We present our recent surgical experience with two difficult cases in which alternative surgical treatment methods were used with success.
Methods: Seven newly diagnosed craniopharygiomas were treated at Children's Hospital of Alabama from January of 2005 to January of 2006. Two in particular posed unique surgical challenges.
Results: The first child was a neonate harboring a 8 x 7 x 6 cm calcified suprasellar lesion spanning the anterior and middle cranial fossa bilaterally. Given the size of the

tumor and the neonate's physiologic limitations, successful elective staged resection of the lesion at 8 and 16 days of age was undertaken. The second case was a 3 year old child who presented with a 6 x 6 x 5.5 cm cystic lesion that encompassed most of the left middle and anterior fossa with significant extracranial extension into the sinuses. Biopsy and marsupialization via a transnasal approach was performed. Follow-up imaging reveals marked reduction of the lesion.
Conclusions: We feel that elective surgical staging and extracranial marsupialization are both viable alternatives that should be considered when dealing with giant, complex, and atypically-presenting craniopharyngiomas in children. Surgical staging allows for controlled but aggressive tumor resection in a neonate with limited physiologic reserve. Marsupialization appears to help reduce the cystic component of tumor while reducing the risk on visual and endocrine structures. While these surgical strategies are not new, the neurosurgeon who deals with these lesions may benefit from their utilization.

119. **Are Nasal "Lymphatic" Pathways Alternative Sites of CSF Absorption in the H-Tx Rat?**
Jogi V. Pattisapu, MD; Mohammad Nabiuni, PhD; Mohamed Gharnit; Leena Paul, MA (Orlando, FL)
Introduction: Conventional teaching holds that cerebrospinal fluid (CSF) is produced in the choroid plexus and absorbed by arachnoid villi. This absorption pathway seems less developed in infants and alternative pathways for CSF absorption have been suggested. Nasal 'lymphatics' via the cribriform plate into the facial venous system have been shown to be functional in most mammals and may play a role in hydrocephalus.
Methods: We studied this pathway in the congenital hydrocephalus-Texas (H-Tx) rat model that affects ~40% of littermates, to evaluate the nasal secretory mechanism in affected and unaffected animals in comparison to control Sprague-Dawley (SD) rats. SD, unaffected H-Tx, and affected hydrocephalic (HC) rat pups were studied at 4 and 10 days after subarachnoid injection of Evans Blue dye via sub-occipital injection into the space. Dissecting microscopy and digital imaging facilitated qualitative comparison of dye penetration into the nasal pathways from the cribriform plate region.
Results: We observed that affected hydrocephalic pups had less dye in the nasal regions compared with unaffected littermates and control SD animals. This difference was more pronounced at postnatal day 10, and more clearly visible in the deeper sinus regions. No dye was noted in the cervical lymphatics in this acute injection model.
Conclusion: Alternative pathways for CSF circulation and absorption via nasal "lymphatics" have been suggested, and may play a role in hydrocephalus.

120. **Diagnostic Yield of Standard CT Scans in Diagnosis of Chiari Malformation in Pediatric Population**
Mirza Baig, MD, PhD; Moumen Asbahi, BS; Scott Elton, MD (Columbus, OH)
Abstract: MRI of the brain is considered to be the preferred neuroimaging modality for the diagnosis of Chiari I malformation. The sagittal views are especially useful for adequate measurement of the tonsillar displacement with respect to the foramen magnum. However, CT scan of the head is far more frequent then MRI in the pediatric population for multitude of reasons. There is increasing tendency for the radiologist to comment of the position of the cerebellar tonsils in relations to the foramen magnum. Based on the CT findings the radiologist recommends further imaging studies such as MRI brain to elucidate the location of tonsils and possible diagnosis of Chiari malformation. We analyzed the clinical usefulness and the diagnostic yield of CT scans in the evaluation of Chiari malformation. We preformed a retrospective study of patients at Children's Hospital in Columbus, Ohio from 2000-2005. Radiology dictation of CT head where searched for keywords: Chiari and tonsillar ectopy. These records were reviewed and patients with known diagnosis of Chiari or patients that underwent outside neuroimaging such as MRI were excluded. Patients that underwent CT followed by MRI for evaluation of Chiari were analyzed. MRI reports were reviewed and percentages of diagnosed Chiari malformation were correlated. Literature review of the diagnostic yield of CT scans for diagnosis of Chiari will also be discussed. This study will aid in the clinical decision to further investigate radiological CT scan findings of tonsilar ectopy for suspected Chiari malformation in the absence of clinical symptoms.

121. **Multimodality Treatment of Pediatric Cerebral Aneurysms**
Gregory G. Heuer, MD, PhD; Michael F. Stiefel, MD, PhD; Riyadh Al-Okaili, MD; Anuj Basil, BS; Suresh Magge, MD; Linda Bagley, MD; John B. Weigele, MD, PhD; Leslie N. Sutton, MD; Robert W. Hurst, MD; Phillip B. Storm, MD (Philadelphia, PA)
Introduction: Intracranial aneurysms are rare in the pediatric population and occur with a reported prevalence ranging from 0.5% to 4.6%. The authors reviewed the recent clinical experience at one institution during the time frame when multimodality treatment has been available.
Methods: Pediatric patients who presented with a diagnosis of intracranial aneurysm during the past 10 years (between July 1995 and December 2005) were evaluated. Patients with aneurysmal enlargement of the Vein of Galen or aneurysms associated with arteriovenous malformations (AVMs) were not included in this study.
Results: Twenty-three patients were identified. The patients ranged in age from 4 months to 16 years old (mean 6.2 years). Thirteen patients were boys, and 9 were girls. Patients presented with subarachnoid hemorrhage (10), trauma (3), cranial nerve deficit (1), or incidentally/other diagnoses (9). Follow-up data was available for 18 patients. Eleven patients were independent, 5 were dependant, and 2 patients died. The patients were treated with either standard endovascular (12 patients) or microsurgical (11 patients) techniques. In the endovascular group the aneurysm was present in the anterior circulation in 7 cases and in the posterior circulation in 5 cases. The aneurysm size ranged from 1 to 35 mm (mean 12.7 mm). In the microvascular group the aneurysm was present in the anterior circulation in 10 cases and in the posterior circulation in 1 case. The aneurysm size ranged from 3 to 20 mm (mean 7.8 mm).
Conclusions: Microsurgical and endovascular techniques can be effectively used to treat cerebral aneurysms in a broad range of pediatric patients.

122. **Chiari 1.5 Malformation Masquerading as Lumbar Radiculopathy**
Ilya Laufer, MD; Murray Engel, MD; Mark M. Souweidane, MD (New York, NY)
Introduction: Chiari malformations may present with a wide range of symptoms and signs. However, an isolated foot drop as a presenting symptom of a Chiari 1.5 malformation has not been described in the pediatric neurosurgical literature. We present the case of a six year old boy who presented with a two-week history of weakness in left dorsiflexion.
Methods: The medical history, imaging studies, operative report and nine-month follow-up data have been reviewed for a child who was treated at the Weill Medical College of Cornell University.
Results: A six-year old boy presented to the chief complaint of isolated left lower extremity weakness and intermittent back pain. Occupational therapy assessment revealed a visual motor age of four. Upon examination, the child had 1/5 left dorsiflexion weakness and 4/5 left plantarflexion weakness. Sensory examination revealed a relative hypesthesia in the left L5 dermatome. MRI of the spine only revealed holocord syringomyelia. MRI of the brain revealed herniation of cerebellar tonsils down to the level of C1 and medullary kinking, findings consistent with a Chiari 1.5 malformation. The child underwent a suboccipital decompressive craniectomy with C1 laminectomy and autologous duroplasty. At nine months postoperatively he has normal motor function without complaints.
Conclusions: This is the first case report of a Chiari 1.5 malformation presenting with an isolated foot drop. Decompressive suboccipital craniectomy effectively treated the child's motor deficit and provided restoration of muscle strength. Chiari malformations may rarely masquerade as a radiculopathic process and if appropriately treated may result in excellent recovery of function.

123. **The Use of a Peal Away Introducer Sheath for Distal Catheter of a Ventriculoperitoneal Shunt**
William J. Thoman, MD; Edward J. Kosnik, MD (Columbus, OH)
Introduction: Ventriculoperitoneal shunt is the standard treatment for hydrocephalus in most cases. Over the past six months we can report of 8 cases where with the assistance of pediatric surgeons and laparoscopy, the distal catheter was introduced into the peritoneal cavity using a 7 French peal away introducer sheath.
Methods: Our study group consisted of 8 patients with hydrocephalus who had undergone multiple revisions previously. In all patients, the proximal catheter and valve were tested first prior to insertion of peritoneal catheter. With the help of pediatric surgeons who had laparoscopic access to the peritoneum, the distal catheter is tunneled and inserted into the peritoneal cavity using a peal away introducer sheath. The sheath is introduced by making a punch incision in the skin and then placing a guide wire into the peritoneal cavity under laparoscopic visualization. The sheath is then placed over the guide wire and inserted until visualized in peritoneal cavity. The catheter is then inserted as the sheath is slowly pealed away.
Results/Conclusion: The use of the peal away introducer sheath and laparoscopy, allows direct visualization of the catheter as it is introduced into the peritoneal cavity. This allows the surgeons to place the catheter in an area of decreased adhesions to maximize CSF reabsorption. In addition the used of the introducer sheath allows us to make a punch incision on the skin in addition to the laparoscopic trochars. As a result patient report of decreased incisional pain.

124. **Variations in Surgical Technique to Aid in Placement of the Peritoneal Shunt Catheter**
Mirza Baig, MD, PhD; Moumen Asbahi, BS; Chris Karas, MD Edward Kosnik, MD (Columbus, OH)
Introduction: Lumbar peritoneal and ventriculoperitoneal shunts are widely used for the treatment of hydrocephalus. The abdominal portion of these procedures is most frequently placed with small laparotomy in the abdominal cavity under direct vision. The distal catheter is placed into peritoneal cavity and secured with purse-string anchor. We describe a technical note to guide the proper placement of the abdominal catheter.
Methods: Once the peritoneal cavity is entered by dissection of the rectus muscle and incision of the transversalis fascia and peritoneum. The peritoneum is identified and verified and opened between clamps. Prior to placement of the peritoneal catheter into the peritoneal cavity, we describe a technique where the shunt passer is inserted just under the peritoneum and passed into the subcutaneous space cranially. Once the passer has established a track, the distal catheter is connected to the shunt and CSF flow is verified. At this time the catheter is inserted into the peritoneal cavity under direct vision. The peritoneum is closed with absorbable sutures in a running manner.
Results/Conclusion: We show clinical evidence that this is safe and easy technique that avoids the cumbersome purse-sting anchors required by the conventional method. Some of the potential complications and its avoidance will be discussed. We will also discuss, compare and illustrate the different surgical variations in placement of the peritoneal catheter.

125. **Effects of Tumor Laterality on Parent- and Child-Reported Quality of Life in Pediatric Brain Tumor Patients**
Zarui Melikyan, PhD (Hershey, PA); Leslie J. Kim-Cunningham, PhD (Boston, MA); Elias Risk, MD; Jonas Sheehan, MD, FACS; Elana Farace, PhD (Hershey, PA)
Introduction: Brain tumor (BT) patients' perceived quality of life (QOL) becomes of utmost importance with medical care advance. Right hemispheric tumor lateralization is associated with poor QOL and significant anxiety in adult patients. However, little is known of the effects of tumor lateralization on pediatric population's QOL. The purpose of this study was to determine the relationship between tumor lateralization and QOL in pediatric population as compared to their parents' estimations of child's QOL.
Methods: 13 pediatric BT patients (2 female, 11 male), age 5-22 years (mean 14.96). 92% were Caucasian, 8% African American. 69% were right- and 31% left-handed. Education ranged 0-13 years (mean 8). Tumor types: astrocytomas, gangliogliomas, germinomas, PNETs and DNETs. Seven patients had right-sided and six had left-sided tumor localization. Patients' parents were given the Pediatric Oncology QOL Scale (POQOL), all but three patients filled in children's version of this questionnaire (POCOL) - an adaptation of the POQOL for child self-report. ANOVA was performed.
Results: A significant elevation of POQOL Emotional subscale ($F=4.93$, $p=0.048$), a trend of elevation of POQOL Total score ($F=4.09$, $p=0.068$), and POQOL Reactivity subscale ($F=3.53$, $p=0.087$) but not POQOL Physical functioning subscale in reports on children with right hemisphere tumors were found. Similar trends which did not reach significance were seen in children responding to POCOL questionnaire.
Conclusion: Preliminary findings suggest decreased perceived QOL in pediatric BT patients with right-sided tumors, especially emotional adjustment and reaction to the disease and treatment. Further, more extensive studies with a larger population are needed.

126. **Bandages, Dressings and Cranial Neurosurgery**
Ken Winston, MD (Denver, CO); Lori A. McBride, MD (New Orleans, LA); Anwar Dudekula, MD (Denver, CO)
Introduction: Bandages and dressings are commonly applied to incisional scalp wounds to prevent complications, particularly infection. Bandaging of cranial incisional wounds requires resources, consumes time of health care workers and has expense. It is therefore reasonable to examine its efficacy.
Methods: All cranial operations (excluding shunt operations, procedures on scalp alone and burr hole procedures) done between June 30, 2001 and January 1, 2006, by two neurosurgeons in two hospitals (one adult and one pediatric) were reviewed. Surgical site infections and other postoperative complications were investigated with respect to the use of bandaging and other aspects of postoperative wound management.
Results: A total of 702 operations were done in 577 patients and only 5 received any type of surgical bandaging. There were 4 surgical site infections. The infection rate for the 626 clean cases was 0.48 percent and for the 38 clean-contaminated cases was 2.63 percent.
Conclusions: Bandaging incisional scalp wounds following cranial surgery adds little if any benefit beyond the easier, simpler and cheaper practice of using antibiotic ointment as a dressing with no bandaging.

127. **A Multi-Modality Frontal Approach to the Fourth Ventricle in a Case of Loculated Hydrocephalus**
Chris S. Karas, MD; David Gonda, BS; Scott W. Elton, MD (Columbus, OH)
Introduction: Loculated hydrocephalus is a well-known complication of ventriculitis. Loculation of CSF compartments causing hydrocephalus is most often seen following intraventricular hemorrhage, shunt infection, or neonatal meningitis. Patients with a combination of these factors may be particularly at risk. The resulting inflammation, whether from an infectious or chemical process, causes a subependymal glial fibrosis within the ventricular system. Areas where such fibrosis becomes exposed through the ependyma serve as propagation points for the development of intraventricular webs which disrupt the natural flow of CSF through the ventricles causing loculations and hydrocephalus.
Methods: Endoscopic approaches and shunt placements in the presence of distorted and discontinuous ventricular anatomy may require significant preoperative planning. Imaging studies play an important role in planning treatment strategies before and during procedures. In this paper we describe a frontal approach to a superiorly displaced loculated fourth ventricle.

Results: In combination with ventriculoscopy and fluoroscopy a fourth ventriculostomy was performed with evidence of egress into the subarachnoid space on intraoperative ventriculography. Also, a ventriculostomy catheter was positioned in the fourth ventricle through this trajectory using a guide-wire exchange technique over the endoscope.
Conclusions: Fourth ventriculoscopy through a frontal approach was used effectively with intraoperative ventriculography to treat this patient with loculated hydrocephalus. Also, endoscopically-assisted shunt placement through a modified Seldinger technique aided in fourth ventricular catheterization in the setting of ventricular distortion.

128. **Aggressive Variant of Papillary Glioneuronal Tumor**
Ramin J. Javahery, MD; J. Gordon McComb, MD; Laurence Davidson, MD; Ignacio Gonzalez, MD (Los Angeles, CA)
Introduction: Introduction: Papillary glioneuronal tumor (PGNT) was initial described in 1998. A total of 23 cases have been reported. All have had benign clinical courses. We are presenting two patients with aggressive clinical courses.
Methods: A retrospective review of the case histories of two patients with PGNT treated between 2000 and 2006 was undertaken. The clinical histories, imaging studies, and histology were reviewed. Previously published case reports/series were also reviewed.
Results: Patient 1 was 13 years-old and patient 2 was 7 years-old, both females. On MRI both lesions were large (5-9cm) cystic tumors, with rim/nodular enhancement, minimal edema, and extension to the ventricular system. The cyst fluid was hypointense on T1 and hyperintense on T2 with faint septations. Patient 1 had a gross total resection while patient 2 had a sub-total resection. The histology showed a bimodal population of cells. A pseudopapillary area with a central hylanized vessel surrounded by single layer of cells that stained for vimentin and GFAP (astrocytic). A second portion containing variable sized cells that stained for synaptophysin and PGP 9.5 (glial). Patient 1 had multifocal recurrence 4 years after surgery. All lesions resolved within 18 months with fractionated radiation and chemotherapy (temador). Patient 2 had progression of residual disease within 3 months of resection. The proliferative indices (Ki-67) were 5% and 4%, respectively. Previously cited proliferative indices for PGNT's were < 5% to 3%.
Conclusion: We are reporting an aggressive variant of PGNT's that is identical to previously described PGNT histologically but with a higher proliferative index than previously described.

129. **Successful Microsurgical Extraction of a Migrated Coil After Failed Endovascular Closure of a Blalock-Taussig Shunt**
Gregory G. Heuer, MD, PhD; Kareem A. Zaghloul, MD, PhD; Roberts Richard, MD; Michael F. Stiefel, MD, PhD; Phillip B. Storm, MD (Philadelphia, PA)
Introduction: Coil migration is a rare but potentially serious complication of endovascular procedures. Occasionally coils can be retrieved by endovascular techniques. We describe the microsurgical management of a case in which endovascular techniques failed.
Methods: A 2-year old girl with pulmonary atresia and a Blalock-Taussig shunt underwent attempted endovascular closure of the shunt with Gianturco steel coils with Dacron. During deployment the coil was lost into the aorta and an angiogram showed the coil lodged in the proximal M1. The coil could not be retrieved by endovascular techniques. The patient was emergently taken to the operating room for a craniotomy. After the Sylvian fissure was split, the coil was readily visible through the vessel wall. Temporary clips were placed on the proximal M1 and the proximal M2s, trapping the coil. A small arterotomy was performed and the coil was removed and arterotomy was closed.
Results: Post-operative imaging demonstrated minimal changes in the basal ganglia consistent with ischemia, but the remainder of the scan was unremarkable. A cerebral angiogram showed excellent perfusion with no dissections. There was narrowing of the proximal temporal M2 likely secondary to vasospasm. The patient was extubated on postoperative day 1. Her motor exam demonstrated a mild hemiparesis on the left with no tremulousness.
Conclusions: Coil migration can be treated by microsurgical techniques in pediatric patients with a good clinical outcome.

130. **Development of 'Tunable' Rifampicin-Impregnated Silicone Catheters Using Polymer Coatings**
Xuemei Liang, PhD; Haiying Tang, BS; Anfeng Wang, PhD; Ting Cao, BS; Steven O. Salley, PhD; James P. McAllister, PhD; K.Y. Simon Ng, PhD (Detroit, MI)
Introduction: Our previous study demonstrated that cast molding is an effective approach for sustainable long-term release of antibiotic from silicone. This study aimed to modulate or 'tune' antibiotic release from a cast-molded catheter by coating with a self-assembled silane monolayer.
Methods: Rifampicin was loaded into silicone by cast molding. Biocompatible perfluorodecyltrichlorosilane (FAS) and octadecyltrichlorosilane (OTS) were deposited on the drug-loaded silicone surface by chemical vapor deposition and molecular vapor deposition, respectively.
Results: The amount of rifampicin released in the first 24 hours ('burst' effect) decreased by 70.2% (multi-FAS layers), 39.7% (FAS-coated), and 7.8% (OTS-coated) compared to non-coated rifampicin-loaded silicone. The release rate was slower for coated systems in the first 11 days, and then became higher than that of non-coated samples. This trend remained for 110 days (60 days for multi-FAS layers). Almost twice as much rifampicin was released from the FAS-coated silicone, compared to un-coated rifampicin-loaded silicone. The diffusion coefficient D* (cm2.s-1), which represents the amount of antibiotics diffusing across a unit area through a concentration gradient in time, of multi-FAS layers (1.77 ? 10 -8 cm2.s-1) was 10 times less than original rifampicin-silicone (1.83 ? 10-7cm2.s-1).
Conclusions: Mutli-FAS coatings are effective in controlling and tuning antibiotic release rate. Moreover, they can partially serve as a hydrophobic barrier to reduce bacterial and neural cell adhesion. Future development of the coating approach may allow delivery rates to be customized and tailored to specific patients.

MEMBERSHIP ROSTER

Rick Abbott, MD
Childrens Hospital at Montefiore
3316 Rochambeau Ave.
Bronx, NY 10467

Jafri Malin Abdullah, MD, PhD
Hosp. Univ. Sci/Neurosurgery/Neurosci.
Jalan Hospital USM Kubang Kerian
Kota Bharu Kelantan, 16150
Malaysia

P. David Adelson, MD, FACS
Children's Hosp. of Pittsburgh
3705 5th Ave./Neurosurgery
Pittsburgh, PA 15213-2583

Nejat Akalan, MD, PhD
Hacettepe University Sch. of Med.
Dept. of Neurosurgery
Ankara, 6100
Turkey

A. Leland Albright, MD
Univ. of Wisconsin/Neurosurgery
600 Highland Ave. K4/836
Madison, WI 53792

Philipp R. Aldana, MD
#1005
836 Prudential Dr.
Jacksonville, FL 32207

Lance Altenau, MD
Ste. 700
501 Washington
San Diego, CA 92103

A. Loren Amacher, FRCS
3 Hospital Dr.
Lewisburg, PA 17837

Luis V. Amador, MD
Ste. 336
1440 Veteran Ave.
Los Angeles, CA 90024-4832

Ahmed S. Ammar, MD, PhD
King Fahd Military Medical Complex
Building 71 Flat G02
Dhahran, 31932
Saudi Arabia

Jim D. Anderson, MD
PO Box 658
San Carlos, CA 94070-0658

Richard C. E. Anderson, MD
Neurological Institute
710 W. 168th St. Rm. 421
New York, NY 10032

Brian T. Andrews, MD
Ste. 421
45 Castro St.
San Francisco, CA 94114

Thomas J. Arkins, MD
Connecticut Neurosurgery PC
330 Orchard St. Ste. 316
New Haven, CT 06511-4417

Patricia A. Aronin, MD, MS
Central Texas Neurosurgery for Children
1106 Clayton Lane Ste. 200W
Austin, TX 78723

Elaine J. Arpin, MD
S.W. Florida Neurosurgical Assoc.
413 Del Prado Blvd. Ste. 102
Cape Coral, FL 33990-5703

Wilson T. Asfora, MD, FRCS(C)
Ste. 104
1210 W. 18th St.
Sioux Falls, SD 57104

Saleh S. Baeesa, MBChB, FRCS
King Abdulaziz University Med. Ctr.
PO Box 80215
Jeddah, 21589
Saudi Arabia

Walter L. Bailey, MD
500 River St.
Minneapolis, MN 55401

Gene A. Balis, MD, FACS
Neurological Surgeons Associates
3000 E. Fletcher Ave. Ste. 340
Tampa, FL 33613-4645

Benedicto Cortes Baronia, MD
Univ. of East RMM MC/Neurosurgery
Aurora Blvd. Rm. 241 2nd Fl.
Quezon City, 1113
Philippines

Steven J. Barrer, MD, FACS
Abington Neurosurgical Associates
2510 Maryland Rd. Ste. 185
Willow Grove, PA 19090-1134

Henry M. Bartkowski, MD, PhD
Akron Childrens Hospital
1 Perkins Square Rm. 6411
Akron, OH 44308-1062

James E. Baumgartner, MD
3418 Georgetown St.
Houston, TX 77005-2910

Robert Micheal Beatty, MD
Neurosurgery of Kansas City
2040 Hutton Rd. #105
Kansas City, KS 66109-4564

William O. Bell, MD
Neurosurgical Assoc. of the Carolinas
2810 N. Maplewood Ave.
Winston Salem, NC 27103-4138

Mitchel S. Berger, MD, FACS
UCSF/Dept. of Neurosurgery
505 Parnassus Ave. M-786
San Francisco, CA 94143-0112

Jose A. Bermudez, MD
Children's Hosp./Neurosurgery
200 Henry Clay Ave.
New Orleans, LA 70118

Karin Sabin Bierbrauer, MD
Cincinnati Children's Med. Ctr.
3333 Burnet Ave./Ped. Neurosurgery
Cincinnati, OH 45229

Peter McL. Black, MD, PhD
Brigham Women's Hospital
75 Francis St./Neurosurgery
Boston, MA 02115

Jeffrey P. Blount, MD, FACS
Children's Hospital of Alabama
1600 7th Ave. S. ACC 400
Birmingham, AL 35233

John Scott Boggs, MD
Ste. 104
1820 Barrs St.
Jacksonville, FL 32204

Frederick A. Boop, MD, FACS
Semmes Murphey Clinic
1211 Union Ave. Ste. 200
Memphis, TN 38104-3562

William R. Boydston, MD
Pediatric Neurosurgery Assoc.
5455 Meridan Mark Rd. Ste. 540
Atlanta, GA 30342-1640

Douglas L. Brockmeyer, MD
Primary Children's Medical Center
100 N. Medical Dr. Ste. 2400
Salt Lake City, UT 84113-1103

Jeffrey A. Brown, MD, FACS
Ste. 118
600 Northern Blvd.
Great Neck, NY 11021

Derek A. Bruce, MD
2577 Township Rd.
Quakertown, PA 18951-3350

Michael James Burke, MD, FACS
Neurosurgery Inst. of South Texas
3643 S. Staples
Corpus Christi, TX 78411-2456

MEMBERSHIP ROSTER *continued*

George T. Burson, MD
Neurosurgery Arkansas
9601 Lile Dr. Ste. 310
Little Rock, AR 72205

Leslie D. Cahan, MD
Kaiser Foundation Hospital
1505 N. Edgemont St. Rm. 4141
Los Angeles, CA 90027-5209

Jeffrey W. Campbell, MD
A.I DuPont Hosp. for Children
1600 Rockland Rd./Neurosurgery
Wilmington, DE 19803

Carolyn Marie Carey, MD, FACS
880 6th St. S.
St. Petersburg, FL 33701

Peter W. Carmel, MD
UMDNJ-New Jersey Med. Sch.
90 Bergen St. Ste. 7300
Newark, NJ 07103-2425

Benjamin Solomon Carson, MD
Johns Hopkins Univ. Hosp.
600 N. Wolfe St. Harvey 811
Baltimore, MD 21287-8811

Oguz Cataltepe, MD
Div. of Neurosurgery
55 Lake Ave. N. Ste. S2-848
Worcester, MA 01655

Jeffrey E. Catrambone, MD
22 Oak Ridge Ave.
Summit, NJ 07901

Michael J. Chaparro, MD, FACS
Palm West Pediatric Neurosurgery
3898 Via Poinciana Ste. 18
Lake Worth, FL 33467

Paul H. Chapman, MD, FACS
Massachusetts General Hospital
55 Fruit St. GRB502
Boston, MA 02114-2696

Raymond W. Chaseling, MD
2 Pymble Ave.
Pymble, NSW 2073
Australia

William R. Cheek, MD
3009 Robinhood
Houston, TX 77005

W. Bruce Cherny, MD
Ste. 202
100 E. Idaho St.
Boise, ID 83712

Maurice Choux, MD
14 av Solvert C
Marseille, 13009
France

Samuel F. Ciricillo, MD, FACS
5238 Fair Oaks Blvd.
Carmichael, CA 95608-5766

David Douglas Cochrane, MD
Childrens & Womens Hlth. Ctr. of BC
B2W 4500 Oak St.
Vancouver, BC V6H-3N1
Canada

Alan R. Cohen, MD, FACS
Rainbow Babies & Children's Hosp.
11100 Euclid Ave. Rm. B501
Cleveland, OH 44106-1736

John Jeffrey Collins, MD
4759 Ridgetop Dr.
Morgantown, WV 26508

Shlomo Constantini, MD, MSc
Dana Children's Hospital/Tel Aviv Med. Center
6 Weizman St./Ped. Neurosurg.
Tel Aviv, 64239
Israel

Richard A. Coulon, Jr., MD
Childrens Hosp./Dept of Neurosurgery
200 Henry Clay Ave.
New Orleans, LA 70118

Kerry R. Crone, MD
Childrens Hosp. Med. Ctr./Neurosurgery
3333 Burnet Ave. ML 2016
Cincinnati, OH 45229-3039

Daniel J. Curry, MD
720 Judson Ave.
Evanston, IL 60202-2506

Robert C. Dauser, MD
Texas Children's Hospital
6621 Fannin Ste. 950
Houston, TX 77030-2303

Richard A. A. Day, MD
Montana Neurosurgery Ctr.
2835 Fort Missoula Rd. Ste. 202
Missoula, MT 59804-7423

Concezio Di Rocco, MD
Univ. Cattolica/Neurochirurgia
Largo Gemelli 8
Rome, 168
Italy

Mark S. Dias, MD
Pennsylvania State Med. Sch.
500 University Dr./Neurosurgery
Hershey, PA 17033

Joseph F. Dilustro, MD
Children's Hospital
601 Childrens Ln. Ste. 5A
Norfolk, VA 23507

Arthur J. DiPatri, Jr., MD
Children's Mem. Hosp./Ped. Neuro.
2300 Children's Plaza Box 28
Chicago, IL 60614

Peter B. Dirks, MD
Hospital for Sick Children
555 University Ave.
Toronto, ON M5G-1X8
Canada

David J. Donahue, MD
Neurosurgery Services
901 Seventh Ave. Ste. 120
Fort Worth, TX 76104-2724

James R. Doty, MD, FACS
Ste. 440
1340 Broad Ave.
Gulfport, MS 39501

James M. Drake, MD
Hospital for Sick Children
555 University Ave. #1504-D
Toronto, ON M5G-1X8
Canada

Ann-Christine Duhaime, MD
Dartmouth Hitchcock Med. Ctr.
1 Medical Center Dr.
Lebanon, NH 03756

Charles Cecil Duncan, MD, FACS
Yale Univ. Sch. of Med.
333 Cedar St. TMP 419
New Haven, CT 06520-8082

John A. Duncan, III, MD, PhD
Ste. 100
55 Claverick St.
Providence, RI 02903-4144

Mary E. Dunn, MD
2425 S. Shore Blvd.
White Bear Lake, MN 55110

Susan R. Durham, MD
Dartmouth-Hitchcock MC/Neurosurgery
1 Medical Center Dr.
Lebanon, NH 03756-0001

Michael S. B. Edwards, MD, FACS
Rm. R207
300 Pasteur Dr.
Stanford, CA 94305-5327

Michael R. Egnor, MD
NY Spine & Brain Surgery PC
Neurosurgery/HSC T12-080 SUNY
Stony Brook, NY 11794-8122

Stephanie L. Einhaus, MD
Semmes-Murphey Clinic
6325 Humphreys Blvd.
Memphis, TN 38120

Howard M. Eisenberg, MD
Univ. of Maryland Med. Ctr.
22 S. Greene St. Ste. S12D
Baltimore, MD 21201-1544

Mostafa A. El Khashab, MD, PhD
4554 Glenwick Ln. #2203
Dallas, TX 75205

Ibrahim Muftah El Nihum, MD, FACS
Ste. 4400
1602 Rock Prairie Rd
College Station, TX 77845

MEMBERSHIP ROSTER *continued*

Richard G. Ellenbogen, MD, FACS
5706 63rd Ave. N.E.
Seattle, WA 98105-2040

Seyed M. Emadian, MD, PhD
Premier Neurosurgery & Spine Ctr.
730 Kings Ln.
Tullahoma, TN 37388

Mark D. Erasmus, MD
New Mexico Neurosurgery P.C.
522 Lomas Blvd. N.E.
Albuquerque, NM 87102-2454

Walter J. Faillace, MD, FACS
812 W. Janice Ct.
La Crosse, WI 54601

Neil Arthur Feldstein, MD, FACS
New York Neurological Inst.
710 W. 168th St. Rm. 414
New York, NY 10032

Ann Marie Flannery, MD, FACS, FA
SSM Cardinal Glennon Childrens Hosp.
1465 S. Grand Blvd.
St. Louis, MO 63104

Eldon L. Foltz, MD
2480 Monaco Dr.
Laguna Beach, CA 92651

Paul C. Francel, MD, PhD
Ste. C
3048 S.W. 89th St.
Oklahoma City, OK 73159-6359

Kathleen B. French, MD
3020 Hamaker Ct. B104
Fairfax, VA 22031-2220

Arno H. Fried, MD
Hackensack Univ. Med. Ctr.
30 Prospect Ave./WFAN Peds Ctr.
Hackensack, NJ 07601

David M. Frim, MD, FACS
University of Chicago
5841 S. Maryland Ave. MC 4066
Chicago, IL 60637-1463

Herbert E. Fuchs, MD, PhD
Duke University Medical Center
Box 3272
Durham, NC 27710

Joseph H. Galicich, MD
PO Box 276
Alpine, NJ 07620-0276

Hugh J. L. Garton, MD, MHSc
Univ. of Michigan/Mott Childrens Hosp.
1500 E. Medical Center Dr.
Ann Arbor, MI 48109-0033

Sarah J. Gaskill, MD, FACS
9909 Emerald Links Dr.
Tampa, FL 33626

Robert T. Geertman, MD, PhD
Metro Health MC/Neurosurgery H-910
2500 Metro Health Dr.
Cleveland, OH 44109-1998

Rosemaria Gennuso, MD
4499 Medical Dr. Ste. 340
San Antonio, TX 78229

Timothy M. George, MD
Pediatric Neurosurgery
1601 Rio Grande Ste. 340
Austin, TX 78701-1149

P. Langham Gleason, MD
1722 9th St.
Wichita Falls, TX 76301

Roberta P. Glick, MD
Cook County Hosp./Neurosurgery
1901 W. Polk
Chicago, IL 60612-3701

John C. Godersky, MD
Anchorage Neurosurgical Assoc.
3220 Providence Dr. Ste. E3-020
Anchorage, AK 99508

James T. Goodrich, MD, PhD
Albert Einstein/Montefiore Med. Ctr.
111 E. 210th St./Neurosurgery
Bronx, NY 10467-2401

Liliana C. Goumnerova, MD, FRCS(C)
Childrens Hospital Bader 365
300 Longwood Ave.
Boston, MA 02115-5724

Paul A. Grabb, MD
Ste. 104
1725 E. Boulder
Colorado Springs, CO 80909

John Andrew Grant, MBChB, FRCS
Univ. of Kansas Med. Ctr.
3901 Rainbow Blvd. MS 3021
Kansas City, KS 66160

Patrick C. Graupman, MD
Fletcher 5
111 Colchester Ave.
Burlington, VT 05401

Clarence S. Greene, MD, FACS
CHildren's Mercy Hosp./Neurosurgery
2401 Gillham Rd.
Kansas City, MO 64108

David P. Gruber, MD
Inland Neurosurgery & Spine Assoc.
105 W. 8th Ave. Ste. 200
Spokane, WA 99204-2318

Laurance J. Guido, MD
Ste. 15A
30 Sutton Pl.
New York, NY 10022-2365

Nalin Gupta, MD, PhD
UCSF-Box 0112
505 Parnassus Ave. Rm. M779
San Francisco, CA 94143-0112

Yoon Sun Hahn, MD, FACS
Univ. of Illinois-Chicago Coll. of Med.
912 S. Wood St./Neurosurg. 4th Fl. N.
Chicago, IL 60612-7325

Stephen J. Haines, MD
Univ. of Minnesota/Neurosurgery
420 Delaware St. S.E. MMC 96
Minneapolis, MN 55455

Mark G. Hamilton, MD
Alberta Children's Hospital
1820 Richmond Rd. S.W.
Calgary, AB T2T-5C7
Canada

Lonnie L. Hammargren, MD
4381 Flandes St.
Las Vegas, NV 89121-5330

Michael Hillel Handler, MD, FACS
Ste. 605 Tammen Hall
1010 E. 19th Ave.
Denver, CO 80218-1034

William C. Hanigan, MD, PhD
1613 Moss Ave.
Peoria, IL 61606

David Houston Harter, MD
NYU Pediatric Neurosurgery
317 E. 34th St.
New York, NY 10016

Michael D. Heafner, MD
Carolina Neurosurgery & Spine Assoc.
225 Baldwin Ave.
Charlotte, NC 28204-3109

Michael A. Healy, MD
Neurosurgical Network Inc.
2222 Cherry St. Ste. MOB2
Toledo, OH 43608

Ian M. Heger, MD
Joe Dimaggio Childrens
Hosp./Neurosurgery
1150 N. 35th Ave. Ste. 300
Hollywood, FL 33021

Leslie C. Hellbusch, MD
Midwest Neurosurgery
8005 Farnam Dr. Ste. 305
Omaha, NE 68114-4441

Robert W. Hendee, Jr., MD
10709 Rigsbee Ct.
Austin, TX 78739

Martin M. Henegar, MD
Carolina Neurosurgery & Spine Assoc.
225 Baldwin Ave.
Charlotte, NC 28204-3109

Thomas J. Holbrook, Jr., MD
720 Rabon Rd.
Columbia, SC 29203

Robert D. Hollenberg, MD
McMaster University
1200 Main St. W. Rm. 4E8
Hamilton, ON L8N-3Z5
Canada

Gregory W. Hornig, MD
Childrens Mercy Hosp./Neurosurgery
2401 Gillham Rd.
Kansas City, MO 64108

MEMBERSHIP ROSTER *continued*

Roger J. Hudgins, MD
Pediatric Neurosurgery Associates
5455 Meridan Mark Rd. Ste. 540
Atlanta, GA 30342-1640

Stephen L. Huhn, MD
Stanford University Medical Center
300 Pasteur Dr. R203/Neurosurgery
Stanford, CA 94305-5327

Robin P. Humphreys, MD, FRCS(C)
67 Lyndhurst Ave.
Toronto, ON M5R 2Z8
Canada

Mark R. Iantosca, MD
Penn State Hershey Med.
Ctr./Neurosurgery H110
500 University Dr. PO Box 850
Hershey, PA 17033-0850

Bermans J. Iskandar, MD
University of Wisconsin - Madison
600 Highland Ave. K4/832
Madison, WI 53792

George I. Jallo, MD
Johns Hopkins Hosp./Pediatric Neurosurg.
600 N. Wolfe St. Harvey 811
Baltimore, MD 21287

Hector E. James, MD
Wolfson Childrens Hosp./Pavilion Bldg.
836 Prudential Dr. Ste. 1005
Jacksonville, FL 32207

John A. Jane, Sr. MD PhD
University of Virginia Health System
Box 800212/Neurosurgery
Charlottesville, VA 22908

David F. Jimenez, MD, FACS
University of Texas/Neurosurgery
7703 Floyd Curl Dr. Box 7843
San Antonio, TX 78229-3900

Dennis L. Johnson, MD
408 Elm Ave.
Hershey, PA 17033-1751

John K. Johnson, MD, FACS
Southeastern Neurosurgical & Spine Inst.
20 Medical Ridge Dr.
Greenville, SC 29605-5605

Martin Johnson, MD
31870 S.W. Country View Ln.
Wilsonville, OR 97070-7476

Mary Morris Johnson, MD, FACS
3223 Chatham Rd.
Atlanta, GA 30305-1101

Robert Francis C. Jones, FRC, FRACS
Sydney Children's Hospital
21 Norfolk St.
Paddington, NSW 2021
Australia

Allen S. Joseph, MD, FACS
10101 Park Rowe Ste. 200
Baton Rouge, LA 70810

John E. Kalsbeck, MD
Riley Hospital for Children
702 Barnhill Dr.
Indianapolis, IN 46202-5200

Paul M. Kanev, MD
Baystate Med. Ctr./Neurosurgery
759 Chestnut St.
Springfield, MA 01199

Samuel S. Kasoff, MD
11 Sycamore Ln.
White Plains, NY 10605

Bruce A. Kaufman, MD, FACS
Children's Hospital of Wisconsin
PO Box 1997
Milwaukee, WI 53201-1997

Robert F. Keating, MD
Children's National Med. Ctr.
111 Michigan Ave. N.W.
Washington, DC 20010

David L. Kelly, Jr., MD
Wake Forest Univ./Neurosurgery
Medical Center Dr.
Winston Salem, NC 27157-1029

John R. W. Kestle, MD
Primary Children's Medical Center
100 N. Medical Dr. Ste. 1475
Salt Lake City, UT 84113-1103

David M. Klein, MD
690 Fearrington Post
Pittsboro, NC 27312-8507

Laurence I. Kleiner, MD
Childrens Medical Center
One Childrens Plaza/Neurosurgery
Dayton, OH 45404-1815

David S. Knierim, MD
GED 4
9300 Valley Children's Pl.
Madera, CA 93638-8761

Edward J. Kosnik, MD
Columbus Children's Hospital
700 Children's Dr.
Columbus, OH 43205

Karl F. Kothbauer, MD
Kantonsspital Luzern
Div. of Neurosurgery/Dept. of Surgery
Luzern, 6000
Switzerland

Mark D. Krieger, MD
1300 N. Vermont Ste. 1006
Los Angeles, CA 90027

Cornelius H. Lam, MD
University of Minnesota
420 Delaware St. S.E. MC 96
Minneapolis, MN 55455-0374

John A. Lancon, MD
St. Dominic Neurosurgery Associates
971 Lakeland Dr./Ste. 657
Jackson, MS 39216

Mark Robert Lee, MD
Med. Coll. of Georgia/Neurosurgery
1120 15th St. BI 3088
Augusta, GA 30912-0004

Michael Lee Levy, MD, PhD
Ste. 502
8010 Frost St.
San Diego, CA 92123

Veetai Li, MD
Children's Hospital of Buffalo
219 Bryant St./Neurosurgery
Buffalo, NY 14222-2006

Kenneth I. Lipow, MD
Connecticut Neurosurgical Specialists
267 Grant St.
Bridgeport, CT 06610-2805

Morris D. Loffman, MD
17173 Strawberry Dr.
Encino, CA 91436

Rafael Longo-Cordero, MD
Univ. Gardens
Calle Rochester 911
San Juan, PR 00927-4812

Ralph C. Loomis, MD
Mountain Neurological Ctr.
7 Vanderbilt Park Dr.
Asheville, NC 28803

Kenneth M. Louis, MD, FACS
#340
3000 E. Fletcher Ave.
Tampa, FL 33613-4656

Mark G. Luciano, MD, PhD
Cleveland Clinic Foundation
9500 Euclid Ave. S80
Cleveland, OH 44195-0001

Thomas G. Luerssen, MD
Riley Hospital for Children
702 Barnhill Dr. Ste. 1134
Indianapolis, IN 46202-5200

Joseph R. Madsen, MD
Children's Hosp./Brigham & Womens
Hosp.
300 Longwood Ave. Rm. 312
Boston, MA 02115-5724

Gail A. Magid, MD
PO Box 66
Wilson, WY 83014-0066

Gary Magram, MD
Inova Children's Hospital
8505 Arlington Blvd. Ste. 100
Fairfax, VA 22031

Kim Herbert Manwaring, MD
Phoenix Children's Hospital
1919 E. Thomas Rd.
Phoenix, AZ 85016-7710

Timothy B. Mapstone, MD
Univ. of Oklahoma HSC/Neurosurgery
1000 N. Lincoln Blvd. Ste. 400
Oklahoma City, OK 73104

Arthur E. Marlin, MD
1948 Carolina Ave. N.E.
St. Petersburg, FL 33703

Todd A. Maugans, MD
Children's Medical Center
1 Children Plaza
Dayton, OH 45404

John R. Mawk, MD, JD
788 Ashland Ave.
St. Paul, MN 55104-7119

James P. McAllister, PhD
WSU Sch. of Med./Neurosurgery
4201 St. Antoine UHC-6E
Detroit, MI 48201

David McAuley, MD
Mill Cottage
10 Mill Rd./Ballyknockan
Newtownards, EN BT236NG
United Kingdom

Jack E. McCallum, MD
1 Stevens Dr.
Benbrook, TX 76126

J. Gordon McComb, MD
University Children's Medical Group
1300 N. Vermont Ave. #1006
Los Angeles, CA 90027-6005

C. Scott McLanahan, MD
Carolina Neurosurgery & Spine Assoc.
225 Baldwin Ave.
Charlotte, NC 28204-3109

Robert L. McLaurin, MD
Apt. 5C
2412 Ingleside Ave.
Cincinnati, OH 45206-2185

David Gordon McLone, MD, PhD
Children's Memorial Hospital
2300 Children's Plaza Ste. 28
Chicago, IL 60614-3318

P. Daniel McNeely, MD
PO Box 9700
5850 University Ave.
Halifax, NS B3K-6T8
Canada

John Mealey, Jr., MD
9315 Spring Forest Dr.
Indianapolis, IN 46260-1269

Michael Dean Medlock, MD
4 Centennial Dr. 2nd Fl.
Peabody, MA 01960-7935

Vivek Mehta, MD, MSc
Univ. of Alberta/Neurosurgery
8440-112 St./2D1.02 MacKenzie HSC
Edmonton, AB T6E-6S8
Canada

Hal S. Meltzer, MD
University of California - San Diego
200 W. Arbor Dr. Ste. 8893
San Diego, CA 92103-8893

Arnold H. Menezes, MD
University of Iowa Hospitals
200 Hawkins Dr./Neurosurgery
Iowa City, IA 52242-1009

W. Jost Michelsen, MD
Ste. 108
330 Borthwick Ave.
Portsmouth, NH 03801

Thomas H. Milhorat, MD
North Shore University Hospital
300 Community Dr./Neurosurgery
Manhasset, NY 11030

John I. Miller, MD, FACS
Ste. 6W
544 E. 86th St.
New York, NY 10028-7536

Mark A. Mittler, MD
Long Island Neurosurgical Associates
410 Lakeville Rd. Ste. 204
New Hyde Park, NY 11042-1103

Richard H. Moiel, MD
3656 Ella Lee Ln.
Houston, TX 77027-4105

Jose L. Montes, MD
Montreal Children's Hospital
2300 Tupper St. Rm. C819
Montreal, PQ H3H-1P3
Canada

Leon E. Moores, MD, FACS
203 Kent Oaks Way
Gaithersburg, MD 20878-5614

Thomas M. Moriarty, MD, PhD
Kosiar Children's Hospital
210 E. Gray St. Ste. 1102
Louisville, KY 40202-3907

Michon Morita, MD
Ste. 712
1380 Lusitana St.
Honolulu, HI 96813

William Joseph Morris, MD
Ste. 2
915 6th Ave.
Tacoma, WA 98405-4662

Glenn Morrison, MD, FACS
980 Lugo Ave.
Coral Gables, FL 33156-6323

S. David Moss, MD
Phoenix Children's Hospital
1919 E. Thomas Rd.
Phoenix, AZ 85016-7710

Michael S. Muhlbauer, MD
Semmes Murphey Clinic
6325 Humphreys Blvd.
Memphis, TN 38120-2300

Michael G. Muhonen, MD
#101
1201 W. LaVeta Ave.
Orange, CA 92868-3835

Karin M. Muraszko, MD
Univ. of Michigan MC TC3470
1500 E. Medical Center Dr.
Ann Arbor, MI 48109-0338

Cheryl A. Muszynski, MD, FACS
Children's Hospital of Wisconsin
999 N. 92nd St. Ste. 310
Milwaukee, WI 53226

S. Terence Myles, MD
Foothills Medical Centre
1403-29 St. N.W. 12th Fl.
Calgary, AB T2N-2T9
Canada

John S. Myseros, MD, FACS
Children's National Med. Ctr.
111 Michigan Ave. N.W.
Washington, DC 20010

Joseph M. Nadell, MD
Children's Hospital
200 Henry Clay Ave.
New Orleans, LA 70118-5720

Mahmoud G. Nagib, MD
305 Piper Bldg.
800 E. 28th St.
Minneapolis, MN 55407-3799

Michael F. Nido, PA-C
Carolina Neurosurgery & Spine Assoc.
225 Baldwin Ave.
Charlotte, NC 28204-3109

Mark Stephen O'Brien, MD
Arkansas Children's Hospital
800 Marshall St. Slot 838
Little Rock, AR 72202

W. Jerry Oakes, MD
Children's Hospital of Alabama
1600 7th Ave. S. ACC 400
Birmingham, AL 35233-1711

Jeffrey G. Ojemann, MD
UW/Children's Hosp. & Regional Med.
4800 Sand Point Way N.E.
Seattle, WA 98105

Greg Olavarria, MD
58 W. Michigan St.
Orlando, FL 32806

Miguel A. Pagan, PA-C
19136 Cypress View Dr.
Fort Myers, FL 33912-4825

Larry Keith Page, MD
13845 S.W. 73rd Ct.
Miami, FL 33158

Dachling Pang, MD
Kaiser Permanente Hospital
280 W. MacArthur Blvd./Ped.
Neurosurgery
Oakland, CA 94611

MEMBERSHIP ROSTER *continued*

Andrew D. Parent, MD
University of Mississippi Medical Center
2500 N. State St.
Jackson, MS 39216-4500

Tae Sung Park, MD
6 Brentmoor Park
St. Louis, MO 63105

Michael David Partington, MD, FACS, FA
Gillette Children's Specialty Healthcare
200 E. University Ave.
St. Paul, MN 55101

Jogi Venkata Pattisapu, MD
Pediatric Neurosurgery PA
58 W. Michigan St.
Orlando, FL 32806-2037

Jerry O. Penix, MD
928 Holladay Point
Virginia Beach, VA 23451

Joseph A. Petronio, MD
Gillette Children's Specialty Healthcare
200 E. University Ave.
St. Paul, MN 55101

Joseph H. Piatt, Jr., MD
St. Christopher's Hosp. for Children
Erie Ave. at Front St.
Philadelphia, PA 19134-1095

Prem K. Pillay, MBBS, FACS
Asian Brain-Spine-Nerve Center
3 Mt. Elizabeth #15-03
Singapore, 228510
Singapore

David W. Pincus, MD, PhD
University of Florida - Gainesville
Box 100265
Gainesville, FL 32610-0265

Thomas Pittman, MD
Univ. of Kentucky Med. Ctr.
800 Rose St. Rm. MS105-A
Lexington, KY 40536

Ian F. Pollack, MD
Children's Hospital of Pittsburgh
3705 5th Ave./Neurosurgery
Pittsburgh, PA 15213-2524

Harold D. Portnoy, MD, FACS
Michigan Head & Spine PC
44555 Woodward Ave. Ste. 506
Pontiac, MI 48341-2982

Mark R. Proctor, MD
Childrens Hospital
300 Longwood Ave. Bader 3
Boston, MA 02115-5724

Mark J. Puccioni, MD
Midwest Neurosurgery
8005 Farnam Dr. Ste. 305
Omaha, NE 68114

Joseph V. Queenan, MD
Hahnemann Univ. Hosp./Neurosurgery
Broad & Vine St. MS407/New College Bldg.
Philadelphia, PA 19107

Corey Raffel, MD, PhD
Dept. of Neurosurgery E6B
200 First St. S.W.
Rochester, MN 55905-0001

John Ragheb, MD
Miami Children's Hosp./Pediatric Neurosurgery
3200 S.W. 60th Ct. Ste. 301
Miami, FL 33136-2104

Mahmoud Rashidi, MD
2601 Oswell St. Ste. 101
Bakersfield, CA 93306

Donald H. Reigel, MD
4222 Corton Ct.
Allison Park, PA 15101-2788

Harold Louis Rekate, MD
Barrow Neurological Institute
2910 N. 3rd Ave.
Phoenix, AZ 85013-4434

Ann M. Ritter, MD
1806 Park Ave.
Richmond, VA 23220

Theodore S. Roberts, MD
Children's Hospital Medical Center
4820 Sand Point Way N.E. CH-50
Seattle, WA 98105

Shenandoah Robinson, MD
Rainbow Babies & Children's Hospital
11100 Euclid Ave. RBC B501
Cleveland, OH 44106-1736

Walker L. Robinson, MD
65 James St.
Urbana, IL 08820

Luis Alberto Rodriguez, MD
Memorial Healthcare
1150 N. 35th Ave. Ste. 300
Hollywood, FL 33021-5424

Bruce R. Rosenblum, MD
Riverview Medical Center
160 Ave. at The Commons
Shrewsbury, NJ 07702-4802

Alan D. Rosenthal, II, MD, FACS
7840 Talavera Pl.
Delray Beach, FL 33446-4321

Allen S. Rothman, MD, FACS
421 Huguenot St. Ste. 36
New Rochelle, NY 10801-7021

Curtis J. Rozzelle, MD
219 Bryant St.
Buffalo, NY 14222

Catherine Anne Ruebenacker-Mazzola, MD
99 Powder Hill Rd.
Montvale, NJ 07645-1017

John R. Ruge, MD, FACS
630 S. Oak St.
Hinsdale, IL 60521-4634

James T. Rutka, MD, PhD
Hospital for Sick Children
555 University Ave. #1504
Toronto, ON M5G-1X8
Canada

Petr O. Ruzicka, MD
Children's Hospital of The King's Daughters
601 Children's Ln. Ste 5A
Norfolk, VA 23507

Robert A. Sanford, MD
Semmes Murphey Clinic
6325 Humphreys Blvd.
Memphis, TN 38120

Osamu Sato, MD
1-5-40 Tamagawa Gakuen
Machida
Tokyo, 1940041
Japan

Guy M. Sava, MD
41 Woodson Bend
Bronston, KY 42518

Steven J. Schiff, MD, PhD
Pennsylvania State Univ.
212 Earth-Engineering Sci. Bldg.
University Park, PA 16802

Steven J. Schneider, MD, FACS
Long Island Neurosurgical Associates
410 Lakeville Rd. Ste. 204
New Hyde Park, NY 11042-1101

Luis Schut, MD
Children's Hospital of Philadelphia
34th & Civic Center Blvd.
Philadelphia, PA 19104

R. Michael Scott, MD
The Children's Hosp. Boston
300 Longwood Ave. Bader 319
Boston, MA 02115-5724

Nathan R. Selden, MD, PhD
Oregon Health & Science Univ./L-472
3181 SW Sam Jackson Park Rd.
Portland, OR 97239-3098

Wan Tew Seow, MD
KK Women's & Children's Hospital
100 Bukit Timah Rd.
Singapore, 229899
Singapore

Ronald F. Shallat, MD
33 Evergreen Dr.
Orinda, CA 94563

John Shillito, MD
102 Cedar Meadows Ln.
Chapel Hill, NC 27517

Howard J. Silberstein, MD
Ste. 305
1445 Portland Ave.
Rochester, NY 14621-3008

James C. Simmons, MD
190 Grove Park Rd.
Memphis, TN 38117

Gary Robert Simonds, MD
6411 Fairway Forest Dr.
Roanoke, VA 24018-7445

Ashutosh Singhal, MD, FRCS(C)
Dept. of Neurosurgery K3-159
4480 Oak St.
Vancouver, BC V6H-3V4
Canada

Stanley O. Skarli, MD
1716 The Timbers S.E.
Grand Rapids, MI 49546

Frederick H. Sklar, MD
Neurosurgeons for Children
1935 Motor St.
Dallas, TX 75235-7701

Edward Robert Smith, MD
Children's Hospital Boston/Neurosurgery
300 Longwood Ave.
Boston, MA 02115

Harold P. Smith, MD
Ste. 106
300 20th Ave. N.
Nashville, TN 37203-2131

Jodi L. Smith, PhD, MD
Riley Hospital for Children
One Children's Sq. Ste. 1730
Indianapolis, IN 46202-5200

Lenwood P. Smith, Jr., MD
Palmetto Neurosurgery & Spine
3 Medical Park Rd. Ste. 310
Columbia, SC 29203-6873

Matthew D. Smyth, MD
St. Louis Children's Hospital
One Children's Pl.
St. Louis, MO 63110

Sandeep Sood, MD
Pediatric Neurosurgery Group PC
3901 Beaubien 2nd Fl.
Detroit, MI 48201

Mark M. Souweidane, MD
Dept. Neurological Surgery
525 E. 68th St.
New York, NY 10021-9800

Sherman Charles Stein, MD
310 Spruce St.
Philadelphia, PA 19106-4201

Paul Steinbok, MD
British Columbia Children's Hosp.
4480 Oak St. Rm. K3-159
Vancouver, BC V6H-3V4
Canada

Thomas C. Steineke, MD, PhD
New Jersey Neuroscience Inst.
65 James St.
Edison, NJ 08818

Bruce B. Storrs, MD, FACS
4521 W. Azeele St.
Tampa, FL 33609-2554

Douglas L. Stringer, MD
2011 N. Harrison Ave.
Panama City, FL 32405-4545

Merle Preston Stringer, MD
2011 N. Harrison Ave.
Panama City, FL 32405-4545

Michael H. Sukoff, MD
1262 Edgeview Dr.
Santa Ana, CA 92705-2331

Peter P. Sun, MD
Children's Hospital of Oakland
744 52nd St./Neurosurgery
Oakland, CA 94609-1810

Anthony F. Susen, MD
193 Old Glebe Point Rd.
Burgess, VA 22432-2006

Leslie N. Sutton, MD
Children's Hospital of Philadelphia
34th & Civic Center Blvd.
Philadelphia, PA 19104

Dale M. Swift, MD
Neurosurgeons for Children
1935 Motor St. 3rd Fl.
Dallas, TX 75235-7701

Michael S. Taekman, MD
15 Oakmont Ct.
San Rafael, CA 94901-1235

Willard D. Thompson, Jr., MD
Neurological Inst. of Savannah
4 Jackson Blvd.
Savannah, GA 31405

Tadanori Tomita, MD
Children's Memorial Hospital
2300 Children's Plaza Ste. 28
Chicago, IL 60614-3363

Eric R. Trumble, MD
Ste. 204
22 Lake Beauty Dr.
Orlando, FL 32806

Gerald F. Tuite, Jr., MD
Ste. 428 CSB/PO Box 250616
96 Jonathan Lucas St.
Charleston, SC 29425

Noel Tulipan, MD
8533 McCrory Ln.
Nashville, TN 37221-5905

Michael S. Turner, MD
Indianapolis Neurosurgical Group
1801 N. Senate Blvd. Ste. 535
Indianapolis, IN 46202-1228

David D. Udehn, MD
Unit E
4350 7th St.
Moline, IL 61265-6870

Ronald H. Uscinski, MD
18111 Prince Philip Dr. #310
Olney, MD 20832

Michael Vassilyadi, MD
Children's Hospital East Ontario
401 Smyth Rd.
Ottawa, ON K1H-8L1
Canada

Joan L. Venes, MD
124643 Camelia Way
Auburn, CA 95602-8268

Enrique C. Ventureyra, MD
Children's Hospital East Ontario
401 Smyth Rd.
Ottawa, ON K1H-8L1
Canada

John Kenric Vries, MD
Pediatric Neuro. Children's Hosp. of Pittsburgh
125 DeSoto
Pittsburgh, PA 15213

Steven L. Wald, MD
97 Grove Ln.
Shelburne, VT 05482

John B. Waldman, MD
Albany Medical College
47 New Scotland Ave. MC-61 NE
Albany, NY 12208

Marion L. Walker, MD
Primary Children's Medical Center
100 N. Medical Dr. Ste. 2400
Salt Lake City, UT 84113-1103

John Wilson Walsh, MD, PhD
Tulane Univ. Sch. of Med.
1430 Tulane Ave. SL47
New Orleans, LA 70112

John D. Ward, MD
Medical College of Virginia
Box 980631 MCV Station
Richmond, VA 23298

Daryl E. Warder, MD, PhD
Bronson Neurological Services
601 John St. Ste. M-124
Kalamazoo, MI 49024

Monica C. Wehby, MD
Microneurosurgical Consultants P.C.
6010 S.W. Orchid Dr.
Portland, OR 97219

Howard L. Weiner, MD
New York University Medical Center
317 E. 34th St. #1002
New York, NY 10016-4974

MEMBERSHIP ROSTER *continued*

Martin H. Weiss, MD, FACS
LAC-USC Medical Center
1200 N. State St. Ste. 5046
Los Angeles, CA 90033-1029

Bradley E. Weprin, MD
Neurosurgeons for Children
1935 Motor St. 3rd Fl.
Dallas, TX 75235-7701

Jean K. Wickersham, MD
Ste. 402
3030 Children's Way
San Diego, CA 92123-4228

Philip J. A. Willman, MD
5325 Greenbriar Dr.
Corpus Christi, TX 78413

Ronald J. Wilson, MD
Ste. 800
400 W. 15th St.
Austin, TX 78701

Joel W. Winer, MD
York Neurosurgical Associates PC
2319 S. George St.
York, PA 17403-5009

Jeffrey A. Winfield, MD, PhD
Ste. 602
1000 E. Genesee St.
Syracuse, NY 13210

Ken R. Winston, MD
1056 E. 19th Ave. Box B330
Denver, CO 80218-1007

Jeffrey H. Wisoff, MD
Ste. 1002
317 E. 34th St.
New York, NY 10016

Daniel Won, MD
11780 Pecan Way
Loma Linda, CA 92354-3452

Meredith V. Woodward, MD
Valley Children's Hospital
9300 Valley Children's Pl.
Madera, CA 93638-8761

Shokei Yamada, MD
5410 Via San Jacinto
Riverside, CA 92506

Karol Zakalik, MD
William Beaumont Hospital
3535 W. 13 Mile Rd. Ste. 504
Royal Oak, MI 48073-6710

Ahmad Zakeri, MD
4235 Secor Rd.
Toledo, OH 43623-4231

Edward J. Zampella, MD
Atlantic Neurosurgical Specialists
310 Madison Ave. Ste. 200
Morristown, NJ 07960

Luis Manuel Zavala, MD
Ste. A-B
555 Mowry Ave.
Fremont, CA 94536-4101

Alexander Zouros, MD
LLUMC/Neurosugery
11234 Anderson St. Rm. 2562B
Loma Linda, CA 92354

John G. Zovickian, MD
Permante Med. Group/Ped. Neuros.
280 W. MacArthur Blvd.
Oakland, CA 94611

2006 AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY ANNUAL MEETING

WEDNESDAY, NOVEMBER 29, 2006

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 29, 2006

Session Details:	Rating Scale: Excellent		Average		Poor
1. The quality of the Oral Abstract Presentations was:	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?
The abstract ~~quality~~ quality was uneven. Some were excellent, but a few were very poor

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?

PLEASE TURN IN EVALUATION FORMS IN EVALUATION DROP BOXES OR AT THE REGISTRATION DESK

2006 AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY ANNUAL MEETING

THURSDAY, NOVEMBER 30, 2006

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 – Thursday, November 30, 2006

	Rating Scale				
Session Details:	**Excellent**		**Average**		**Poor**
1. The quality of the Oral Abstract Presentations were:	A	B	C	D	E
2. The quality of the Raimondi Lecture by Richard D. Lamm	A	B	C	D	E
3. Topics were addressed completely.	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

_____

_____

_____

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

_____

_____

_____

PLEASE TURN IN EVALUATION FORMS IN EVALUATION DROP BOXES OR AT THE REGISTRATION DESK

2006 AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY ANNUAL MEETING

FRIDAY, DECEMBER 1, 2006

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, December 1, 2006

Session Details:	Rating Scale: Excellent		Average		Poor
1. The quality of the Special Symposium was:	A	B	C	D	E
2. The quality of the faculty were:					
a. Ann-Christine Duhaime, MD	A	B	C	D	E
b. Richard D. Krugman, MD	A	B	C	D	E
c. Andrew Sirotnak, 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?

8. Overall, how could these sessions be improved?

9. Did you perceive any commercial bias during these sessions? Yes No
   If yes, please explain

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

PLEASE TURN IN EVALUATION FORMS IN EVALUATION DROP BOXES OR AT THE REGISTRATION DESK

Blood of dif colors ∅ dif ages
Beware digital radii
retinal hem ∅ inflicted
Severe bilateral ⊂folds = major trauma

Injuries not DIA, looks like ischemia

High rate of cervical pathology seen at autopsy
Babies who don't cry are sick
Sick babies should be treated
Treatment helps?