SAVE THE DATE FOR 2005

2005 Annual Meeting of the AANS/CNS Section on Pediatric Neurological Surgery
December 6–9, 2005
Grand Hotel Marriott Resort, Golf Club & Spa
Point Clear, Alabama

The program book was made possible, in part, by an educational grant provided by Codman.
CONTINUING MEDICAL EDUCATION CREDIT (CME)

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

The AANS designates this educational activity for a maximum of 18 hours in Category 1 credit toward the AMA Physician's Recognition Award, with an additional 3.5 hours for the pre-meeting coding course or 3.5 hours for the pre-meeting spinal instrumentation course. Each physician should claim only those hours that he or she actually spends in the educational activity.

DISCLAIMER

All drugs and medical devices used in the United States are administered in accordance with Food and Drug Administration (FDA) regulations. These regulations vary depending on the risks associated with the drug or medical device compared to products already on the market, and the quality and scope of the clinical data available.

Some drugs and medical devices demonstrated or described on the print publications of the AANS/CNS Section on Pediatric Neurological Surgery have a FDA clearance for use for specific purposes or for use only in restricted research settings. The FDA has stated that it is the responsibility of the physician to determine the FDA status of each drug or device he or she wishes to use in compliance with applicable law.
AD HOC COMMITTEES

Traveling Fellowship Committee .... Chair: R. Michael Scott, MD
Lifetime Achievement Award ....... Chair: Thomas G. Luersen, MD
NEUROSURGERY/ON-CALL® Web site .... Chair: Douglas L. Brockmeyer, MD
Publications Committee ............. Chair: Sarah J. Gaskill, MD
Liaison to the American Academy of Pediatrics .................. Joseph H. Platt, Jr., MD
Liaison to the Joint Council of State Neurosurgical Societies .......... Michael Heffner, MD
Representatives to AANS Executive Committee ...... Andrew D. Parent, MD
Alternate: Rick Abbott, MD
Representatives to CNS Executive Committee ...... Andrew D. Parent, MD
Alternate: Rick Abbott, MD
Representative to the Quality Assurance Committee .... Paul A. Grabb, MD
Representative to the Washington Committee ....... Thomas G. Luersen, MD
Representative to the Neurological Surgery Political Action Committee .... Michael Medlock, MD
Representatives to the Outcomes Committee .......... Bruce A. Kaufman, MD
John R.W. Kastle, MD, MSc
Representative to ISPN ............ Cheryl A. Muszynski, MD
Alternate: Bruce Kaufman, MD

J. MICHAEL BISHOP, MD

J. Michael Bishop was born and raised in rural Pennsylvania, and educated at Gettysburg College and Harvard Medical School. While a medical student, he developed an interest in the newly burgeoning field of molecular biology. After a two year hiatus for training in internal medicine, he renewed his pursuit of virus research at the National Institutes of Health in Bethesda, Maryland. In 1967, Dr. Bishop joined a German collaborator in Hamburg. The ensuing year saw little success in research. He then moved to UCSF where he is a Professor and Chancellor and has remained there ever since.

Dr. Bishop began his research career working on the replication of poliovirus. But soon after arriving in San Francisco, he shifted his attention to Rous sarcoma virus. In 1970, he was joined by Dr. Harold Varma. Together, they directed the research that led to the discovery of proto-oncogenes. Bishop has devoted his subsequent research to the study of proto-oncogenes— their functions in normal cells and the manner in which they become cancer genes. In 1989, he and Harold Varma received the Nobel Prize in Physiology or Medicine.

Dr. Bishop has served at The Salk Institute; the National Cancer Advisory Board; the Advisory Committee to the Director of NIH, the Medical Advisory Board for the Howard Hughes Medical Institute, and the Board of Overseers for Harvard University; the Leukemia Society of America, the American Cancer Society, the Burroughs Wellcome Foundation, the St. Jude’s Hospital, the Roche Institute of Molecular Biology, the European Institute of Oncology, the DNAX Research Institute of Molecular & Cellular Biology, the Institute of Molecular Pathology in Vienna, the Basel Institute of Immunology, the San Francisco Exploratorium; and President of the American Society for Cell Biology.

Dr. Bishop is a member of the National Academy of Science, the Institute of Medicine, and the American Academy of Arts & Sciences. He has received numerous awards for his teaching and research. He has also been recognized for his efforts to improve the public understanding of science and federal support for research. He is the author of more than 300 research publications and reviews, and of the book How to Win the Nobel Prize: An Unexpected Life in Science, published by Harvard University Press.
лектуры

1979 E. Bruce Hendrick
1979 Paul T. Budy
1980 Floyd Gilles
1981 Panel Discussion
1982 Panel Discussion
1983 Derek Hoxend-Nash
1984 Anthony E. Gaffo, Jr.
1985 Frank Nultson
1986 William F. Meacham
1987 Dale Johnson
1988 Joseph J. Volpe
1989 Martin Eichelberger
1990 George R. Leopold
1991 Judah Folkman

матсон мемориал лекторы

1987 John Shillito
1988 E. Bruce Hendrick
1989 Martin P. Sayers
1990 Roger Guillemin
1991 Robert L. McLaurin
1992 Joseph Murray
1993 Eben Alexander, Jr.
1994 Joseph Ranschoff
1995 John Holter

1992 Olaf Flodmark
1993 Maurice Albin
1994 Blaise F.D. Bourgeois
1995 Robert H. Pudenz
1996 Samuel S. Flint
1997 Michael Cohen, Jr.
1998 Robert A. Zimmerman
1999 David B. Schurtteff
2000 Steve Berman
2001 Alejandro Benoitain
2002 Volker K.H. Sonntag
2003 Jon Huntsman
2004 J. Michael Bishop

1996 None
1997 Maurice Choux
1998 Lisa Shut
1999 Gary C. Schernewolf
2000 Postponed due to illness
2001 Donald H. Reigel
2002 David Mclone
2003 Robin P. Humphreys
2004 A. Leland Albright

Кеннет Шулман

Приз в Нейробиологии

1984 Arno Fried A Laboratory Model of Shunt-Dependent Hydrocephalus
1985 Ann Christine DuHamel The Shaken Baby Syndrome
1986 Robert E. Breeze Formation in Acute Ventriculitis
1987 Marc R. Deligio Shunt-Induced Reversal of Periventricular Pathology in Experimental Hydrocephalus
1988 Scott FalcO 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 Chemotopic Induction of Collateral Branch Formation
1991 P. David Aedelson Reorganization of the Cortical-Tectal Pathway Following Neonatal Cerebral Hemispherectomy in Cats
1992 David Frick Effects of Biologically Delivered Neurotrophins in Animal Models of Neural Degeneration
1993 Monica C. Weinby 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. Emadiyan Correlation of Chromosome 17p Loss with Clinical Outcome in Patients with Primitive Neuroectodermal Tumors
1996 John Park Platelet Derived Growth Factor Induces Differentiation of Neuronephosphatidyl Stem Cells into Neurons
1997 Michael J. Drezek 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 Gel: 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 Flum 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 Adamsen Mechanisms of Recurrence in 2 Surgical Models of Myelomeningocele Implications for Fetal Surgery
2003 Joshua E. Medow Periurethral Independent Fixation Valve: A Practical Solution to Maintaining Stable Intracraniol Pressure in Shunted Hydrocephalus
2004 To Be Announced

AANS/CNS Section on Pediatric Neurological Surgery

Декабрь 8-11, Сан-Франциско
AWARD RECIPIENTS

1989  ERC ALTSCHULER Management of Persistant 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 Craniosynostosis 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-GRADE 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 Vero Detection of Fluid Flow in Ventriculoperitoneal
   Shunts (VPS) Using Contrast Enhanced Ultrasound
1999  KIMBERLY BINGMAN Hydrocephalus Induces the Proliferation of Cells in the
   Subventricular Zone
2000  No Prize Awarded
2001  JAKE TIMOTHY Treatment of Hydrocephalus Using a Choroid Plexus
   Specific Immunotoxin: An In Vitro Study
2002  JOSHUA MEDOW Quick Brain MRI vs. CT Scan for Evaluating
   Shunted Hydrocephalus
2002  JONATHAN MILLER Abberant Neuronal Development in Hydrocephalus
2003  MARTIN U. SCHUHMAN Serum and CSF C-Reactive Protein in
   Shunt Infection Management
2004  TO BE ANNOUNCED

TRAVELING FELLOWSHIP AWARDS

DOMESTIC
   JOHN DAVID MORENSKI
   PRITHI MORENSKI

INTERNATIONAL
   CHARITY CORDERO

LIFETIME ACHIEVEMENT AWARD

FRED J. EPSTEIN, MD

Fred J. Epstein was born in Yonkers, New York. The middle son of an intellectually gifted family, his struggles with learning issues challenged both him and his parents. It may be this one factor more than any other that formed his character: his drive, his work ethic, his enthusiasm for challenges and his empathy for children.

Upon receiving his BA from New York University in 1959 and his MD from New York Medical College in 1963, Dr. Epstein performed his surgical internship and surgical residency at Montefiore Medical Center in New York City. In 1970 he completed his neurological residency at New York University Medical Center while serving in the United States Army Reserve. Subsequently, Dr. Epstein was appointed to the NYU Medical Center as an Assistant Professor of Neurosurgery. In 1983, he was named professor of Neurosurgery and two years later he was appointed as the first Director of the Division of Pediatric Neurosurgery.

Beginning with the publication of his 1981 paper, "Surgical Management of Holevoed Intramedullary Spinal Cord Astrocytomas in Children," Dr. Epstein undertook and solved many of the problems relating to the neurological treatment of spinal cord tumors, which had previously been deemed insurmountable. His extensive documentation of new techniques and neurological methodology helped advance the treatment of both spinal cord and brain stem tumors.

During his career, Dr. Epstein has served as President of the International Society of Pediatric Neurosurgery, the American Society of Pediatric Neurosurgery, the Pediatric Section of the American Association of Neurological Surgeons/Congress of Neurological Surgeons and Editor-in-Chief of the Journal of Pediatric Neurosurgery. He received fellowships from the American College of Surgeons, the New York Academy of Medicine and the American Academy of Pediatrics. He has published more than 175 papers and has trained pediatric neurosurgeons practicing in the United States, Canada, Europe, the Middle East and Asia.

Following a personal imperative to provide patients with both comfort and state-of-the-art technology, Dr. Epstein was intimately involved in the creation of the Institute of Neurology and Neurosurgery at Beth Israel Medical Center in New York City. It was there that he was able to fulfill his dream of a technologically advanced facility where the special needs of his young patients and their families dealing with the most serious illnesses could be treated in a truly caring and unique environment. Dr. Epstein's philosophy about caring for children is chronicled in his recent book, If I Get to Five, What Children Can Teach Us About Courage and Character.
## PROGRAM SCHEDULE

**WEDNESDAY, DECEMBER 8**

10:00 AM - 5:00 PM

**SPECIAL INSTRUMENTATION COURSE**
University of California San Francisco - Rogers Library - Anatomy Lab (911 S120)
Faculty: Douglas L. Brockmeyer, MD; Henry M. Bosques, PhD; Paul A. Grabb, MD; Christopher P. Anwis, MD

Learning Objectives
- After completion of this course, participants should be able to:
  - Demonstrate familiarity with instrumentation available for C-2 fixation
  - Evaluate and apply the latest surgical techniques for C-2 fixation in children.

11:00 AM - 7:00 PM

**REGISTRATION**
Grand Ballroom A-Foyer Street Level

12:00 - 5:00 PM

**ADVANCED CODING STRATEGIES**
Seafair D-Bay Level
Faculty: John G. Piper, MD

Learning Objective
- After completion of this course, participants should be able to:
  - Apply knowledge of CPT coding to their practice.

12:00 - 4:00 PM

**PRE-MEETING NURSES’ SEMINAR**
Seafair C-Bay Level
Faculty: James Goodrich, MD; Erin Hanson, RN, MS, CPNP; Bernadette Caputo, RN, MSN, NPC; Dawn Kerby-Shafic, RN, CFA; Herra Y. Wang, RN, MSN, CNCC

Learning Objectives
- After completion of this course, participants should be able to:
  - Identify CNS neoplasms seen in infants and treatments for infantile neoplasms
  - Discuss the surgical planning, management, perioperative and postoperative care of the patient with Klippel-Feil syndrome
  - Describe the various vascular malformations found in children and their neurovascular interventional treatments
  - Describe the population of patients with baclofen pumps at the Hospital for Sick Children in Toronto, Canada
  - Describe the development of guidelines for care of holistic care of these children
  - Review the surgical approach and preparation of this surgery and describe the team approach.

**THURSDAY, DECEMBER 9**

6:00 - 8:00 PM

**TAKE OF SAN FRANCISCO OPENING RECEPTION**
Alcatraz 3, 13 W Yes Lounge-Alcatraz Level

7:00 - 8:00 AM

**CONTINENTAL BREAKFAST IN EXHIBIT HALL**
Pacific Concours D-O-Paciﬁc Conference Level

7:00 - 4:40 PM

**EXHIBIT AND POSTER VIEWING IN EXHIBIT HALL**
Pacific Concours D-O-Paciﬁc Conference Level

7:00 AM - 5:30 PM

**REGISTRATION**
Grand Ballroom A-Foyer Street Level

8:00 - 8:00 AM

WELCOME AND OPENING REMARKS
Andrew D. Parent, MD
Grand Ballroom A Street Level

8:05 - 8:15 AM

MEETING OVERVIEW
Nalin Gupta, MD, PhD
Grand Ballroom A-Street Level

8:15 - 9:45 AM

**SCIENTIFIC SESSION I**
Trauma
Grand Ballroom A-Street Level
Moderators: Dusty Dansel Daumhe, MD; Mark S. Doria, MD

Learning Objectives
- Upon completion of this program, participants should be able to:
  - Describe the demographics of nonaccidental trauma in children.
  - Critically evaluate the validity of published guidelines for treatment of pediatric head injury.
  - Identify controversies in the management of closed head injuries in pediatric patients.

8:15 - 9:25 AM

1. Demographics of Infant Abusive Head Trauma in Pennsylvania
   - Mark S. Doria, MD; Henry Kessler; Michele L. Shaffer, PhD; Neel J. Thomas, MD (Hershey, surgical interventions)

8:25 - 8:35 AM

2. Skull Fractures in Children Under Two Years of Age: Accident or Abuse?
   - Yvonne Chinta, BSc; Augustus M. O’Gorman, MD; Jean-Pierre Farmar, MD; Jose L. Montes (Montreal, PQ, Canada)

8:35 - 9:45 AM

**Beverage BREAK IN THE EXHIBIT HALL**
Pacific Concours D-O-Paciﬁc Conference Level

9:45 - 9:55 AM

**SCIENTIFIC SESSION II**
Spondylolisthesis
Grand Ballroom A-Street Level
Moderators: Douglas L. Brockmeyer, MD; Peter P. Sun, MD

Learning Objectives
- Upon completion of this program, participants should be able to:
  - Compare outcomes and current surgical spinal disorders
  - Identify the indications and results of C-2 surgical fixation

9:10 AM - 10:30 AM

10. C-2 Transarticular Screw Fixation: A Review of 74 Patients
   - Richard C. E. Anderson, MD (New York, NY)

11:00 AM - 12:00 PM

12. Congenital Disorders of the Sacrum
   - Michael K. C. Tyler-Kabara, MD, PhD, R. S. Tubbs, PhD, PA-C; John C. Wellons III, MD; Jeffrey P. Blount, MD; W. Jerry Oakes, MD (Birmingham, AL)

1:00 - 2:10 PM

13. Multilevel Cervical Deterioration
   - Christopher P. Anwis, MD (New York, NY)

1:10 - 2:30 PM

14. CT Image Segmentation and 3D Reconstruction for Evaluation of Occipital Cervical Instability in Children
   - Samuel R. Brown, MD, PhD; Lindsey C. McAninch; Greg Jones, PhD; Douglas Brockmeyer, MD (Salt Lake City, UT)

1:20 - 2:20 PM

15. High Frequency Radiotherapy: Surgical Adjunct for Lumbosacral Lipoma Resection and Spinal Cord Deterioration
   - Anders J. Cohen, DO; Steven J. Schneider, MD (New York, NY)

12:30 - 1:30 PM

**Lunch & Poster Viewing in Exhibit Hall**
Pacific Concours D-O-Paciﬁc Conference Level

1:00 - 2:00 PM

   - Richard A. F. Dickson, MD (Paris, France)

1:30 - 2:30 PM

17. MRI Findings in Posterior Ankylosing Spondylitis
   - David D. Latimer, MD (New York, NY)

3:00 - 4:00 PM

18. Supra-pediculate Spinal Cord Transaction for Paraplegic Patients with Myelodysplasia and Dystrophic Symmetrical Tethered Spinal Cord
   - Elizabeth C. Tyler-Kabara, MD, PhD; R. S. Tubbs, PhD, PA-C; John C. Wellons III, MD; Jeffrey P. Blount, MD; W. Jerry Oakes, MD (Birmingham, AL)

3:30 - 4:40 PM

   - Maranda A. Carter, MD; Jonas Anderson, MD (Birmingham, AL)

3:30 - 4:30 PM

20. Bevacizumab in Posterior Ankylosing Spondylitis
   - Maranda A. Carter, MD; Jonas Anderson, MD (Birmingham, AL)

4:30 - 5:30 PM

21. Bevacizumab in Posterior Ankylosing Spondylitis
   - Maranda A. Carter, MD; Jonas Anderson, MD (Birmingham, AL)

7:30 - 9:30 PM

**FLOOR PARTY**
Alcatraz 3, 13 W Yes Lounge-Alcatraz Level

## AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY

**DECEMBER 8-11, SAN FRANCISCO**

1:00 - 2:00 PM

18. Supra-pediculate Spinal Cord Transaction for Paraplegic Patients with Myelodysplasia and Dystrophic Symmetrical Tethered Spinal Cord
   - Elizabeth C. Tyler-Kabara, MD, PhD; R. S. Tubbs, PhD, PA-C; John C. Wellons III, MD; Jeffrey P. Blount, MD; W. Jerry Oakes, MD (Birmingham, AL)

2:00 - 3:00 PM

21. Bevacizumab in Posterior Ankylosing Spondylitis
   - Maranda A. Carter, MD; Jonas Anderson, MD (Birmingham, AL)

2:30 - 3:30 PM

22. Bevacizumab in Posterior Ankylosing Spondylitis
   - Maranda A. Carter, MD; Jonas Anderson, MD (Birmingham, AL)

3:30 - 4:30 PM

23. Bevacizumab in Posterior Ankylosing Spondylitis
   - Maranda A. Carter, MD; Jonas Anderson, MD (Birmingham, AL)
THURSDAY, DECEMBER 9, 2004

3:30 - 4:00 pm SPECIAL TOPIC I
Controversies in Fetal Cord Blood
Moderator: Paul Steinbock, MD

Learning Objectives
Upon completion of this program, participants should be able to:
• Describe the pathophysiology of uterine abnormalities associated with tethered spinal cord
• Compare the treatment approaches for patients with tethered spinal cord

The Role for Urodynamics
Lauren S. Baskin, MD
Surgery is Indicated
Nathan R. Salads, PhD, MD
Surgery is Not Indicated
James M. Drake, MD

4:30 - 5:45 pm SCIENTIFIC SESSION IV
Hydrocephalus

Moderators: Stephen L. Huht, MD; David M. Finn, MD, FACS
Learning Objectives
Upon completion of this program, participants should be able to:
• Evaluate techniques in the treatment of hydrocephalus.
• Evaluate the effects of these techniques on the practice of pediatric neurosurgery.

4:30 - 4:40 pm
25. Antibiotic-Implanted Shunt Catheters Decrease the Incidence of Shunt Infection in the Treatment of Hydrocephalus
Daniel M. Scudilla, MD; R. M. Staut, BA; Matthew J. McGint, MD; Graeme W. Woodworth, BS; Armen F. Sardamian, MD; Benjamin Carasi, MD; George J. Jallo, MD
(Baltimore, MD)

4:40 - 4:50 pm
26. International Infant Hydrocephalus Study (IHHs): Study Design and Prospects
Shlomo Constantini, MD (Tel Aviv, Israel); Spyros Sgouras, MD (Birmingham, United Kingdom); Abhaya Kulkarni, MD (Toronto, ON, Canada)

4:50 - 5:00 pm
27. The Management of Shunt Infection: A Multicenter Pilot Study
John W. Reynolds (Gall Lake City, UT); Hugh Garton (Ann Arbor, MI); William Whitehead (Indianapolis, IN); James Drake; Abhaya Kulkarni (Toronto, ON, Canada)

9:00 - 10:30 am PROGRAM SCHEDULE

5:00 - 5:10 pm
Cite treatment and outcomes for common and uncommon pediatric brain tumors

Joshua E. Minnix, MD (Madison, WI)

1:50 - 2:00 pm
29. Programmable Versus Fixed-Pressure Value for the Treatment of Hydrocephalus in Children
Chris Heller, MD; Mark D. Krieger, MD; David M. Finn, MD; Ryan C. Oh, MD; J. Gordon McComb, MD (Los Angeles, CA)

2:00 - 2:10 pm
30. Cerebrospinal Fluid of Multiloculated Hydrocephalus in Pediatric Patients
David J. Sandberg, MD; J. Gordon McComb; Mark D. Krieger (Los Angeles, CA)

2:30 - 3:45 pm
UPDATING THE MANAGEMENT OF MYELOMENINGOCELE (DOUBLIFE MOMS): THE FIRST 20 MONTHS
Invited Speaker: Catherine Shear, MD (Baltimore, MD)

4:45 - 5:15 pm
ANNUAL BUSINESS MEETING
Grand Ballroom A-Stair Level

6:15 - 7:15 pm
RECEPTION HONORING THE LIFETIME ACHIEVEMENT AWARD WINNER:
FRED J. EPISTEN
Grand Room-Atrium Level

7:00 - 8:00 am
CONTINUOUS BREAKFAST IN EXHIBIT HALL
Pacific Concourse D-O-Pacific Concourse Level

7:00 - 8:00 am
EXHIBIT & POSTER VIEWING IN EXHIBIT HALL
Pacific Concourse D-O-Pacific Concourse Level

7:00 - 7:30 am
REGISTRATION
Grand Ballroom A-Foyer Level

8:00 - 9:30 am
SCIENTIFIC SESSION V
Tumors

Grand Ballroom A-Stair Level
Moderators: Jeffrey H. Wilcox, MD; Juliana C. Goumnerova, MD, FACS

Learning Objectives
Upon completion of this program, participants should be able to:
• Understand the role of new MRI imaging modalities in the diagnosis of pediatric posterior fossa tumors.

Jeffrey G. Ogilvie, MD; James D. Phillips, MD; Richard G. Rabin, MD; Anthony M. Avellino, MD; Avery H. Weiss, MD (Seattle, WA)

9:30 - 9:40 am
Supplementary Approach for Anterior Cranial Fossa Lesions in Children
George J. Jallo, MD (Baltimore, MD); Lazlo Bognar, MD (Budapest, Hungary)

9:30 - 10:30 am
BEVERAGE BREAK IN EXHIBIT HALL
Pacific Concourse D-O-Pacific Concourse Level

10:00 - 11:15 am SCIENTIFIC SESSION VI
Hydrocephalus II

Grand Ballroom A-Stair Level

Moderators: John R. W. Kestle, MD, MSc; Frederick A. Boop, MD, FACS

Learning Objectives
Upon completion of this program, participants should be able to:
• Identify new treatment strategies for complex hydrocephalus.
• Evaluate the role of adjunctive therapy in the management of hydrocephalus.

John R. W. Kestle, MD, MSc; Frederick A. Boop, MD, FACS (Los Angeles, CA)

12:00 - 1:30 pm
LUNCHEON AND POSTER VIEWING IN EXHIBIT HALL
Pacific Concourse D-O-Pacific Concourse Level

1:30 - 2:00 pm
SCIENTIFIC SESSION VII
Vascular and Cerebrovascular Anomalies

Grand Ballroom A-Stair Level

Moderators: Robert A. Sanford, MD; Stephanie Einhaus, MD, DMS; Michael Multabauer, MD (Memphis, TN)

2:30 - 3:00 pm
DECORRELATION OF HEAD SHAPE VS. CEPHALIC INDEX FOR MEASURING OUTCOMES FOR SAGITTAL CRANIOSTYOSIS

Jayash Parikh, MD, FRCS; Robin Gurnett; Steven Patel; Paul Francl; John Honeycutt (Oklahoma City, OK)

2:30 - 3:00 pm
12:30 - 1:30 pm RAIMONDITI LECTURE

Grand Ballroom A-Stair Level

Naila Gunti, MD; Michael J. Bishop, MD; EFACS

11:30 - 12:30 pm
LUNCHEON AND POSTER VIEWING IN EXHIBIT HALL
Pacific Concourse D-O-Pacific Concourse Level

10:40 - 10:50 am
44. Role of SPECT Scanning in Pediatric Hydrocephalus
Deepak Agrawal; Pralay K. Nayar; C.S. Bai; Ashok K. Mahapatra (New Delhi, India)

10:50 - 11:00 am
45. Computed Tomography Based Ventricular Volume Measurement in Radiographically Occult Shunt Malfunction
Prithvi Narayan, MD; Ami Malmudar, MD; Dennis River, MD; Jeffrey R. Leonard, MD; The Seng Park; Ben Lee; Matthew D. Smyth, MD (St. Louis, MO)

11:00 - 11:10 am
46. Chemical Analysis of Fluid Obtained From Intracranial Arachnoid Cysts in Pediatric Patients
David J. Sandberg, MD; J. Gordon McComb, MD; David K. Krieger, MD (Los Angeles, CA)

11:10 - 11:20 am
UPDATING THE HYDROCEPHALUS ASSOCIATION DATABASE

Grand Ballroom A-Stair Level

Yvonne W. Wu, MD (San Francisco, CA)

11:25 - 1:30 pm
INTRODUCTION OF THE RAIMONDITI LECTURE

Grand Ballroom A-Stair Level

Naila Gunti, MD; Michael J. Bishop, MD; EFACS

1:30 - 1:40 pm
47. Eleven of CRABP in the Cerebrospinal Fluid of Moyamoya Disease Patients
Pei-Gu Kim, MD; PING-JI, YO; BYUNG-KWAN KIM, MD; PING-JI, YO; YONG-KOOK KIM; JUNG-AE MO; JIN HAE, KIM

2:00 - 2:10 pm
48. Pediatric Intracranial Aneurysm: Development and Treatment Following Microsurgical and Endovascular Treatment
Nader Sanae, MD; Alfred Quinones-Hinojosa, MD; Nalina M. Gupta, MD; Philip Charles; J. Wilson; Christopher F. Dowd, MD; Victor L. Perry, MD; M. Lawton, MD (San Francisco, CA)

1:50 - 2:00 pm
MICROSURGICAL TREATMENT OF Pediatric Arteriovenous Malformations: Recent UCF Experience
Reine O. Sanchez-Mejia, MD (San Francisco, CA); Savana Chinnapparao, MB; BS (Berkeley, CA); Nalina Gupta, MD, PhD; Victor Perry, MD; Michael W. McDermott, MD; M. Lawton, MD (San Francisco, CA)

2:00 - 2:10 pm
50. Delayed Repair of Spina bifida: Significance of Intracranial Pressure
Robert F. Kastin, MD; Jonathan Martin, MD; Michael Boyalany, MD; Jeffrey Ponsky, DM, DF; Derek Bruce, MD (Washington, DC)

2:10 - 2:20 pm
51. Developmental Delay in Children with Cerebral Palsy: A Descriptive Study
Jayash Parikh, MD, FRCS; Robin Gurnett; Steven Patel; Paul Francl; John Honeycutt (Oklahoma City, OK)

2:30 - 3:00 pm
2:30 - 2:40 pm
52. Correlation of Head Shape vs. Cephalic Index for Measuring Outcomes for Sagittal Craniosynostosis
Jayash Parikh, MD, FRCS; Mike Dixon; Donna Tepper; Don Parker; Christie Burgin; John Honeycutt (Oklahoma City, OK)

2:30 - 2:40 pm
53. The Risk of CSF Rhinorrhea in Craniofacial Surgery
Glenn Morrison, MD; Stephen Anthony Wolfe; John Rahgeb (Miami, FL)

2:40 - 2:50 pm
54. Microsurgical Approach to Craniosynostosis
James E. Baumgartner, MD; John F. Tischgeasser, MD (Houston, TX)

AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY

DECEMBER 8-11, SAN FRANCISCO
PROGRAM SCHEDULE

2:50 - 3:00 PM
55. Delayed Multisegment Syndenham's Clinical Features and Surgical Correction Khaled A. Aly, MD, Adlakha A. Moshavar, MD; Ahmed Zaiter, MD; Ashraf Elhag, MD (Giza, Egypt)
3:00 - 3:30 PM
BEVERAGE BREAK EXHIBIT HALL
Pacific Concourse D-O-Pacific Concours Level

SPECIAL TOPIC III
Review Topic: Advances in Diagnostic and Interventional Neuroimaging Grand Ballroom A-Strait Level
Moderator: Nalin Gupta, MD, PhD
Learning Objectives
- Explain the use of MED-DTI in brain tumors.
- Describe perfusion and spectroscopic MR imaging.
- Describe endovascular management of Vein of Galen malformations.
- MEG-DTI for Presurgical Mapping of Pediatric Brain Lesions Pratik Munkari, MD
- Perfusion and Spectroscopic Imaging of Brain Tumors Scootme Cha, MD
- Current Endovascular Management of Vein of Galen Malformations Christopher F. Dowd, MD

4:30 - 5:30 PM
SCIENTIFIC SESSION VII Functional and Epilepsy Grand Ballroom A-Strait Level
Moderator: Bernard J. Islander, MD; Warwick J. Feintraub, MD
Learning Objectives
Upon completion of this program, participants should be able to:
- Predict anticipated seizure control following resective surgery.
- Review common complications following epilepsy surgery.
4:30 - 4:40 PM
56. Vagus Nerve Stimulation for Induced Spinal Cord Seizures: Insights into Szelau Cessation Elizabeth C. Tyler-Kabara, MD, PhD; R. Shana Taitsh, PhD, PAC-C; Jeffrey P. Blount, MD; John C. Wallace III, MD; W. Jerry Oakes, MD (Birmingham, AL)
4:40 - 4:50 PM
57. Epilepsy Surgery in Young Children Andrea Douglas, Nicholas Post, Joanne Labue, Daniel Miles; Orn Davisvky, Howard L. Weiner, MD (New York, NY)

SATURDAY DECEMBER 11, 2004

9:10 - 9:20 AM
69. Hammatorrhaphy Sequelae of Endoscopic Surgery for Intraventricular Tumors in the Pediatric Population Andreas J. Cohen, DO; Mark M. Souweidane, MD (New York, NY)
9:20 - 9:30 AM
70. Continous Spinal Drain following Endoscopic 3rd Ventriculostomy: Changing the Definition of Failure Shlomo Constantini, MD; Pinar Ozdek, MD; Jonathan Roth, MD; Liana Ben Avadi, MD (Tel-Aviv, Israel)
9:30 - 10:00 AM
SPECIAL LECTURE
The Fate of Pelvic Surgery Grand Ballroom A-Strait Level
Michael R. Harrison, MD (San Francisco, CA)
10:00 - 10:30 AM
BEVERAGE BREAK IN THE EXHIBIT HALL
Pacific Concourse D-O-Pacific Concours Level

10:30 AM - 12:00 PM
SCIENTIFIC SESSION XI General Interest Grand Ballroom A-Strait Level
Moderators: Victor L. Perry, MD; Anne Marie Flannery, MD, FACNS, FA
Learning Objectives
Upon completion of this program, participants should be able to:
- Recognize recent techniques and technical advances in a variety of pediatric neurosurgical practices.
10:30 - 10:40 AM
71. Strategy for Coping with the New Neurosurgical Residency 80 Hour Work Week in a Busy Pediatric Emergency Department Stephanie L. Einhaus, MD, Michael Mukhibauer, MD, Frankloos Fij, MD; Robert Sanford, MD (Memphis, TN)
10:40 - 10:50 AM
72. The Adult Practice of Pediatric Neurosurgery: Clinical, Referral, and Financial Issues David Finn, MD, PhD; Rita Martin-Douglas, MBA (Chicago, IL)
10:50 - 11:00 AM
73. Impact of a Nurse Practitioner on a Pediatric Neurosurgical Service Judith Hollerman, MSN, RN; David Finn, MD, PhD (Chicago, IL)

PRESENTATION OF THE HYDROCEPHALUS ASSOCIATION AWARD
12:00 - 12:30 PM
CLOSING REMARKS
Nalin Gupta, MD, PhD

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1. DEMOGRAPHICS OF INFANT ABUSIVE HEAD TRAUMA IN PENNSYLVANIA
Mark S. Dias, MD; Henry Kester; Michelle L. Shaffer, RN, BSN; Neal J. Thomas, MD (Shuman, PA).

2. SKULL FRACTURES IN CHILDREN UNDER TWO YEARS OF AGE: ACCIDENT OR ABUSE?
Yeminae Chalta, BSC; Augustus M. O’Gorman, MD; Jean-Pierre Farmer, MD; Jose L. Montes, MD (Montreal, PQ, Canada).

3. SUBDURAL HEMATOMAS IN INFANTS WITH BENIGN ENLARGEMENT OF THE SUBARACHNOID SPACES ARE NOT PATHOGENIC MONOMIC FOR CHILD ABUSE
Daniel McNeely, MD, FRCS(C) (Halifax, NS, Canada); Jean-Pierre Farmer, MD, FRCS(C); Jeffrey Atkinson, MD, FRCS(C); Jose L. Montes, MD, FACS; Gauvri Seigal, MD; Augustin M. O’Gorman, MD (Montreal, PQ, Canada).

4. NEUROSURGICAL INJURIES ASSOCIATED WITH ALL-TERRAIN VEHICLES IN PEDIATRIC PATIENTS: OUR TEN YEAR EXPERIENCE
Jose A. Menendez, MD, Francesco T. Margano, DO, Pratik Narayan, MD; Matthew Smyth, MD; Jeffrey Leonard, MD; Tee Sung Park, MD (St. Louis, MO).

5. PREDICTORS OF EARLY CLINICAL OUTCOME IN PEDIATRIC MINOR HEAD INJURY
Jeffrey D. Atkinson, MD, FRCS(C); Debbie Friedman, PT; Jose L. Montes, MD, FACS; Jean-Pierre Farmer, MD, FRCS(C) (Montreal, PQ, Canada).

6. "MOVING TARGET" MRI FOR EVALUATION OF HEAD TRAUMA IN UNSEDATED CHILDREN: EXPERIMENTAL STUDIES USING LARGE ANIMAL MODELS
Kenneth Shulman Award Candidate
Dimitrios Nikas, MD, Alex Memourian, MD, Ann Christine Duhamel, MD (Lebanon, NH).

7. THE VALUE OF LIMITING RADIOGRAPHIC EVALUATION FOR DETECTION OF PEDIATRIC SPINAL CORD INJURY
Kenneth Shulman Award Candidate
Stephanie Greene, MD, Mark R. Proctor, MD; Eric J. Woodard, MD; Dennis L. Johnson, MD (Boston, MA).

8. CERVICAL SPINE CLEARANCE AFTER TRAUMA IN THE PEDIATRIC POPULATION
Richard C. E. Anderson, MD (New York, NY); Kira W. Hansen, RN; Douglas L. Brockmeyer, MD (Salt Lake City, UT).

9. MATURATION-DEPENDENT RESPONSE TO TRAUMATIC SUBDURAL HEMATOMA IN THE IMMATURE PORCINE BRAIN
Susan R. Durham, MD; Richard Tyasmain, MD (Portland, OR); Ann Christine Duhamel, MD (Lebanon, NH).

10. C-1-2 TRANSTISSERTIC SCREW FIXATION: A REVIEW OF 74 PEDIATRIC PATIENTS FOR SURGICAL INDICATION, FUSION RATE, COMPLICATIONS, AND LESSONS LEARNED
Wayne M. Glin, MD; Douglas L. Brockmeyer, MD (Salt Lake City, UT).

11. LONG TERM MAINTENANCE OF CERVICAL ALIGNMENT AFTER OCCIPITAL CERVICAL FUSION IN PEDIATRIC PATIENTS
Richard C. E. Anderson, MD (New York, NY); Peter Kan, MD; Wayne M. Glin, MD; Douglas L. Brockmeyer, MD (Salt Lake City, UT).

12. MICRODISCECTOMY VS. CONSERVATIVE MANAGEMENT OF PEDIATRIC DISC DISEASE: OUTCOMES IN THE MODERN ERA
Kevin L. Stevenson, MD; Roger J. Hudgins, MD; William R. Boyden, MD, PhD; Andrew Reines, MD; Cathy Foyt, PA-C (Atlanta, GA).

13. MULTILEVEL CERVICAL DISCONNECTION ANOMALY - INITIAL DESCRIPTION, EMBRYOGENESIS AND MANAGEMENT
Kenneth Shulman Award Candidate
Paul Kline, MD, MPH; Robert Anderson, MD; UT; Doug Brockmeyer, MD (Salt Lake City, UT).

14. CT IMAGE SEGMENTATION AND 3D RECONSTRUCTION FOR EVALUATION OF OCCIPITAL-CERVICAL INSTABILITY IN CHILDREN
Samuel R. Brown, MD, PhD; Lindsey M. Malinchik; Greg Jones, PhD; Douglas L. Brockmeyer, MD (Salt Lake City, UT).

15. HIGH FREQUENCY RADIOGRAPHY: SURGICAL ADJUNCT FOR LUMBOSacral LIPOMA RESECTION AND SPINAL CORD DETETTERING
Andras J. Cohen, DO; Steven J. Schneidler, MD (New York, NY).

16. CONSERVATIVE MANAGEMENT OF ASYMPTOMATIC SPINAL LIPOMAS OF THE CONUS
Abigail V. Kulkami, MD, FRCSC (Toronto, ON, Canada); Alain Pierre-Kahn, Michel Zerah (Paris, France).

17. THE NEED FOR A NEW THEORY OF LIPOMYELOMEGALOCOELES FORMATION
Timothy M. George, MD; Thomas J. Cummings, MD (Durham, NC).

18. SUPRA-PLACODE SPINAL CORD TRANSECTION FOR PARALYMPIC PATIENTS WITH MYELODYSPLASIA AND REPETITIVE SYMPTOMATIC TETHERED SPINAL CORD
Elizabeth C. Tyler-Kabara, MD, PhD; R. S. Tubbs, PhD; Paul A., John C. Wallora, MD, Jeffrey P. Blount, MD; W. Jerry Oakes, MD; (Birmingham, AL).

19. SPINAL CORD EPIDERMOIDS FOLLOWING FETAL SURGERY FOR MYELOMENINGOECELES: CLINICAL CORRELATIONS AND FOLLOW-UP
Leslie N. Sutton, MD (Philadelphia, PA); Ian F. Pollock, MD (Pittsburgh, PA); Gerald Tuite, MD (St. Petersburg, FL); Arnold Menezes, MD (Iowa City, IA); Leland Albritton, MD (Pittsburgh, PA).

20. MYELOMENINGOECELES AND MECONIUM
Josephine Wyatt-Ashmead, MD, Andrew Parent, MD; John Lancon, MD; Amanda Ellis-RJ; James Bohm, MD; Steven Biegl, MD; Amanda Ashmead (Jackson, MS).
66. THE ROLE OF ENDOSCOPIC MINIMALLY INVASIVE CRANIOTOMY FOR THE TREATMENT OF SCAPHOCEPHALY
Ian M. Hoge, MD, Eric Stelck; D. Schnaitman, MS. PhD (Hollywood, FL)

67. IMPACT OF A NURSE PRACTITIONER ON A PEDIATRIC NEUROSURGICAL SERVICE
Judy Hallman, MSN, RN, David F. Phillips, PhD (Chicago, IL)

68. VIRTUAL REALITY AS A TRAINING TOOL FOR NEUROPLASTIC PROCEDURES
Hydrocephalus Award Candidate
Sumant Manjil, MD, M. Cenac Canavaggio, MBA, Reynald Nayal, Ann Christine Duhain;, PhD (Cleveland, OH)

69. USE OF RAPID MRI TECHNIQUES IN UNSEDATED CHILDREN
Hydrocephalus Award Candidate
Pramila B. Qabeela, MD, Amr Moumen, MBA, Reynald Nayal, Ann Christine Duhain, PhD (Lebanon, NH)

70. HERPIN BINDING EPIDERMAL GROWTH FACTOR (HB-EGF) OVEREXPRESSION IS INPLICATED IN THE DEVELOPMENT OF HYDROCEPHALUS IN TRANSGENIC MICE
Hydrocephalus Award Candidate
Bart A. McDonald, MD, Gerhard Raab, PhD, Kasinath Bruce, Goshi, PhD, Sun Yanping, PhD, Eichiro Nishi, PhD, Nika Iwen, PhD, Michael Klapdor, PhD, Joseph R. Medow, MD, Boston, MA

71. CONTINUOUS SPINAL DRAIN FOLLOWING ENDOSCOPIC 360 DEGREE VENTRICULOMY: CHANGING THE DEFINITION OF FAILURE
Shimura Constantino, MD, Pinar Coklu, MD, Jonathan Rottke, MD, Luca Ben-Avadi, MD (Tel Aviv, Israel)

72. THE EFFICACY OF DURASILN IN A DURAL SUBSTITUTE FOLLOWING CHARI DECOMPRESSION
Kenneth Shulman Award Candidate

73. PROPER SELECTION CRITERIA FOR SURGICAL MANAGEMENT OF BIRTH-RELATED BUNOLIPID PALSYS
Kenneth Shulman Award Candidate
Karen K. Thomas, MD, Richard D. Goldfarb, MD, Timothy M. George, MD (Durham, NC)

1. DEMOGRAPHICS OF INFANT ABUSE HEAD TRAUMA IN PENNSYLVANIA
Mark S. Diaz, MD, Henry Kaslour, Michele L. Shaffer, PhD, Neal J. Thomas, MD (Hershey, PA)

Introduction: Virtually nothing is known about the demographics of abusive head injury in infants under 12 months of age except for the general mantra that 'abusive head injury can potentially occur in any segment of society.' We had an opportunity to study the demographics of abusive head injury in this group.

Methods: All records of substantiated abus- ive head injury in infants under 12 months of age were gathered retrospectively from the Child Live database (Pennsylvania Division of Children Youth and Families) cross referenced to the infants' birth certificates. Data from both documents were abstracted to generate a composite demographic for these infants and their families which was compared with state-wide norms.

Results: A total of 327 infants were identified between 1996 and 2002 inclusive representing an incidence rate of 6.7 per year and 3.3% percent of all newborns. Many of the social demographics were statistically different from the state norms. For example, the parents of these infants were younger, less educated, less likely to have been married at the time of the child's birth, and less likely to have had a college degree, compared with state-wide norms. In contrast, no differences in the 'medical' demographics (such as AHI birth weight, parity, complications of pregnancy, method of delivery, or complications of delivery) were found.

Conclusions: Non-linear skull fractures in isolation are not pathognomonic of non-accidental trauma. In the absence of other classical injuries at presentation, the suspicion of child abuse should be appropriately considered.

3. SUBDURAL HEMATOMAS IN INFANTS WITH BENIGN ENLARGEMENT OF THE SUBARACHNOID SPACES ARE NOT PATHOGENIC FOR CHILD ABUSE
Daniel McKeely, MD, FRSCS (Halifax, NS Canada); Jean-Pierre Farmer, MD, FRSCS; Jeffrey Atkinson, MD, FRSCS; Jose L. Mones, MD, FAC, PCs; Louis A. Egan, MD; Augustin M. Gorman, MD (Montreal, PQ, Canada)

Introduction: Non-linear skull fractures are often thought to be an indication of non- accidental head injury in children under 2 years of age. As a result, families with infants who present with this kind of fractures are subjected to the scrutiny of social service and youth protection. The purpose of this study was to show that non-linear skull fractures can also occur regularly as a result of accidental trauma.

Methods: Skull radiographs of children up to 2 years of age who were diagnosed with skull fracture at the Montreal Children's Hospital in a 36-month were retrospectively and blindly reviewed by a neuroradiologist. The cases showed non-linear or multiple skull fractures were selected and further evaluated to determine whether child abuse had been demonstrated. This cohort was then compared to a group of age-matched patients with proven child abuse to look for distinguishing features.

Results: Of 127 cases of skull fractures 28 were non-linear or multiple fractures. All 28 were isolated injuries without other evidence of skeletal trauma. Nine had CT findings of pialto small subdural or epidural collections. Twenty-eight had somatic disease investigations ruling out child abuse. In the non-accidental group, of a total of 11 patients only three had linear, single fractures. Nine of these patients had associated skeletal injuries at presentation and one had retinal hemorhages.

Conclusions: Non-linear skull fractures in isolation are not pathognomonic of non-accidental trauma. In the absence of other classical injuries at presentation, the suspicion of child abuse should be appropriately considered.

4. NEUROSURGICAL INJURIES ASSOCIATED WITH ALL-TERRAIN VEHICLES IN PEDIATRIC PATIENTS: OUR TEN YEAR EXPERIENCE
Joe A. Menendez, MD, Francesco T. Mangano, DO, Prithiv Narayan, MD, Matthew Smyth, MD, Jeffrey Leonard, MD, Tae Sun Park, MD (St. Louis, MO)
ORAL ABSTRACTS

Introduction: All-Terrain Vehicles (ATV) have been described as inherently unstable vehicles and are associated with injuries to children during accidents. The purpose of this study is to analyze our experience with neurological injuries sustained during ATV-related accidents.

Methods: A retrospective analysis of all admissions to the St. Louis Children's Hospital due to ATV-related accidents between 1993 and 2003 was performed. All patients with a neurological injury were included.

Results: 185 patients were admitted as a result of ATV accidents. 77 patients sustained a head injury, and of these 62 were male and 20 female ranging from ages 3 to 17. Most common injuries were skull fractures (32 patients) and closed head injuries (30 patients). 21 patients had intracranial hemorrhages and 11 spine fractures. There were 11 neurological procedures performed in these patients, including six craniotomies for elevation of depressed fractures, three craniotomies for drainage of hematomas and two intracranial monitor placements. There were no cases of spinal cord injury and no patients performed for spinal decompression or stabilization. Hospital stay varied between 1 and 143 days, with a mean of 6.6 days. 57 patients were discharged home, 3 were transferred to another hospital, one required inpatient rehabilitation and two died.

Conclusions: ATV related accidents result in significant injuries to children. A large percentage of these patients sustained a neurological injury requiring hospitalization, surgery or rehabilitation. Further efforts must be made to increase the proper operation and safety of ATVs, including education to parents and children and stricter laws concerning their use.

5. PREDICTORS OF EARLY CLINICAL OUTCOME IN PEDIATRIC MINOR HEAD INJURY

Jeffrey D. Aminoff, MD, FRCS(C); Debbie Friedman, PT, Josie L. Montiel, MD, FAICS; Jean-Pierre Farmer, MD, FRCS(C) (Montreal, PQ, Canada)

Introduction: Mild head injuries represent a significant volume of trauma seen by a pediatric emergency department. At our institution a predefined set of admission criteria has resulted in many mild head injuries being admitted for observation often in lieu of neuroradiography with CT. The vast majority of these children are identified on the following day with need for acute neurosurgical or medical intervention, thus follow up is provided, when appropriate, for long term cognitive, developmental, and physical issues.

Methods: We performed a retrospective review of all of the admissions with suspected head injuries from April 2001 to April 2003. We classified mild or moderate from our traumatic injuries database and explored clinical and demographic factors affecting length of stay. Predictors of length of stay were evaluated using univariate and multivariate statistical analysis.

Results: 185 of the 6103 head injuries seen at the MCW ER were admitted to the hospital. 1074 of these patients had injuries classified as mild or moderate with 80.4% being discharged within one day of injury admission. Predictors of length of stay longer than one day included injury severity classification, emergency room GCS, MVA or arrest, need for intensive care, admission to transport to hospital, and multi-system injury.

Conclusions: The majority of children observed in the hospital for mild head injuries will remain well without the need for acute medical or neurosurgical intervention. Evaluation of predictors of prolonged hospital stay may allow more diagnostic and treatment algorithms designed to direct acute medical resources to children most at risk.

6. MOVING TARGET: MRI FOR ELIMINATING LS IN UNSEDATED CHILDREN: EXPERIMENTAL STUDIES USING LARGE ANIMAL MODELS

Kenneth Shulman Award Candidate

Dmitrii Nekras, MD, MD, Alaa Memmish, MD, Ann-Christine Duhaime, MD (Lebanon, NH)

Introduction: Because of concerns regarding sedation and radiation exposure from CT scans used to evaluate children with head injury, recent attention has focused on alternate techniques. We report our experience with immature spine models of various traumatic lesions using "Moving Target" MRI techniques compared to CT scans.

Methods: 1-month-old piglets were anesthetized and underwent placement of spinal monitoring and placement of intracerebral hemorhages using autologous blood. Subjects underwent "quick-brain" (fast imaging) T2WI and "Moving-Target" techniques ("Propeller"), GE MRI including T1, T2, and diffusion sequences. CT scans with 3.5-mm cuts were then performed, followed by autoregressive localization and measurement of lesions.

Results: Both MRI and CT were relatively insensitive in detecting subdural blood. "Quick-brain" scans could identify some degree of mass effect, but could not discern blood products. "Moving-target" MRI provided improved anatomic resolution, and some of these sequences, particularly diffusion, identified mass lesions comparable to CT. "Moving-target" sequences take longer than "quick-brain" scans (minutes vs. 30 seconds) but allow for correction for movement. Thus, MRI is a valuable tool in elucidation of small brain size and small lesions, which may decrease its sensitivity compared to children.

Conclusions: Newer MRI techniques hold promise for brain imaging of unedated children, with the advantages of decreased radiation and bone artifact, and no need for sedation. Continued efforts to shorten scan time and improve resolution are ongoing, with the goal of clinical testing in pediatric patients.

7. THE VALUE OF LIMITING RADIATION: EVALUATION FOR DETECTION OF PEDIATRIC SPINAL CORD INJURY

Kenneth Shulman Award Candidate

Stephen Green et al, Mark R. Proctor, MD, Eric J. Woodford, Dennis L. Johnson, MD (Boston, MA)

Introduction: Spinal cord injury (SCI) is a relative rarity in the pediatric population. Its evaluation usually warrants obtaining X-rays, CT scans, and MR images. Many of these studies yield little additional information, but expose the patient to significant radiation cost.

Methods: Pennsylvania Trauma Registry was queried for cervical SCI's in patients younger than age 14 years between 1986 and 1998. 375 records at the six pediatric trauma centers in Pennsylvania were identified. A retrospective chart review was performed.

Results: 145 records were excluded from the study for a diagnosis of cervical strain or absence of cervical spine injury. Of the 224 patients remaining, there were neurological deficits and an additional 23% had neck pain. In those patients with cervical SCI who underwent an adequate lateral cervical spine x-ray study, the injury was identified by this film 88% of the time. 39% of these patients had head injuries. The cost of films that were not necessary for diagnosis in this cohort of patients was $18,373, or an average of $1,868 per patient.

Conclusions: Cervical SCI is frequently associated with head injury in children. The lateral cervical spine x-ray film is highly predictive of an injury to the cervical spine, as is the presence of neurological deficit. A CT of the cervical spine is indicated in these patients. An MRI is necessary for patients with symptoms or persistent neck pain. Limiting the radiographic tests performed will result in substantial cost savings.

8. CERVICAL SPINE CLEARANCE AFTER TRAUMA: NEW STUDIES IN INFANTS AND CHILDREN

Richard C. E. Anderson, MD (New York, NY), Kas W. Hansen, RN, Douglas L. Broomeker, MD (Salt Lake City, UT)

Introduction: Currently, no diagnostic criteria exist for cervical spine clearance in children after trauma. The purpose of this study was to determine if re-education and initiation of a new protocol based on the NEXUS criteria to clear the cervical spine could safely increase the number of cervical spine clearance by non-neurosurgical personnel.

Methods: Data regarding cervical spine clearance in children (ages 0-18 years) after trauma activation at our institution from 2001-2004 were collected and reviewed. Radiographic and clinical methods of clearing the cervical spine, as well as the type and management of intracranial injury are reviewed for the period of two periods: (1) 2001-2003, and (2) January 2004-present.

Results: From 2001-2003, nearly 100% of 936 cervical spine clearances were performed by the neurosurgical service. Twenty-one ligamentous injuries and eight fractures were detected, with five patients requiring operative stabilization. Since January 2004, 117 of 181 (66.5%) cervical spine clearances were obtained by non-neurosurgical personnel. Five ligamentous injuries and one fracture were identified, with one patient requiring operative stabilization. No late injuries have been detected in either time period.

Conclusions: The protocols utilized have been effective in detecting cervical spine injuries in children after trauma, with the new protocol increasing the number of cervical spine clearances by non-neurosurgical personnel by greater than 60%. Re-education with establishment of protocols can safely facilitate clearance of the cervical spine after trauma by non-neurosurgical personnel.

9. MATURATION-DEPENDENT RESPONSE TO TRAUMATIC SUBDURAL HEMATOMA IN THE IMMATURE PORCINE BRAIN

Susan K. Durham, MD, PhD (Portland, OR), Anne-Christine Duhaime, MD (Lebanon, NH)

Introduction: Animal models of maturation dependent response to traumatic brain injury (TBI) have recently been developed. Despite differing mechanisms of injury, these models suggest that infants may confer relative neuroprotection from TBI. The present study investigates the response of the immature brain to an experimental subdural hematoma in animals of three different age groups.

Methods: 15 piglets (five each of age 1 week, 1 month and 4 months) were included for study. A subdural hematoma, skated to 10% of brain volume, was created via a right parietal burr hole. At seven days animals were euthanized and brains were harvested and TUNEL stained. Brain injury was determined using standard histological criteria such as meningeal inflammation, gliosis or infarction. TUNEL positive cells per high power field were counted to quantitate cell death.

Results: Meningeal inflammation as the only histologic indicator of brain injury was found in 51% 1-week old, 0% 1-month old and 13% 4-month old animals. Subcortical gliosis was found in 0% 1-week old and 1-month old and 25% 4-month old animals. Ipsilateral hemorrhagic infarction was found in 0% 1-week old, 25% 1-month and 3% 4-month old animals. TUNEL staining demonstrated 0 cell/kilofield in the 1-week old, 26 cell/kilofield in the 1-month old and 75 cells/kilofield in the 4-month old animals.

Conclusions: This study demonstrates an important maturation-dependent response to a scaled subdural hematoma. Younger animals are less vulnerable to a scaled subdural hematoma than their older counterparts. Future work that will further investigate into the specific cellular mechanisms that confer relative neuroprotection in younger animals is warranted.

10. C-1 TRANSVERSAL SCREW FIXATION: A REVIEW OF 74 PEDIATRIC PATIENTS FOR SURGICAL INDICATION, RESULTS, COMPLICATIONS, AND LESSONS LEARNED

Wayne M. Glui, MD, Douglas L. Broomeker, MD (Salt Lake City, UT)

Introduction: Instability of the atlantoaxial or craniovertebral joint complex presents unique challenges in pediatric spine surgery. Placement of C-1 transversal screws is associated with high fusion rates and relatively low risk.

Methods: A retrospective review of 74 consecutive patients (26 female; 48 male) 16 years of age and younger; in whom at least one C-1 transversal screw was placed was performed. A total of 138 transversal screws were placed in 74 patients. Mean age at time of surgery was 9.0 years (range 1.7-16.7) Surgical indications were trauma in 26 patients, odontoid fractures in 22 patients, and congenital anomalies in 22 patients. Forty-seven patients underwent atlantoaxial arthrodesis and 27 patients underwent occipital-cervical fusion. Ten patients had undergone a total of 17 posterior fusion attempts prior to referral to Primary Children's Medical Center.

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Results 67 patients have been followed for at least three months after surgery. Fusion was achieved in all 67 patients (100%). Mean time to fusion was 7.0 months. Complications occurred in seven patients (10%). Most were minor, though two confirmed vertebral artery injuries were identified. Neither resulted in permanent neurologic injury. Other complications included infection in four patients, and one hardware failure requiring reoperation.

Conclusions CT-2 transarticular screw placement, when coupled with the appropriate atlantoaxial or cranioaxial bone/graft construct, resulted in a 100% fusion rate in a large group of patients with cervical pathology. The risks of CT-2 transarticular screw placement can be minimized in the pediatric patient population with careful patient selection and preoperative planning.

11. LONG TERM MAINTENANCE OF CERVICAL ALIGNMENT AFTER OCCIPITAL CERVICAL FUSION IN PEDIATRIC PATIENTS

Richard C. E. Anderson, MD (New York, NY); Peter Kim, MD; Wayne M. Glid, MD; Douglas L. Brockmeier, MD (Salt Lake City, UT)

Introduction: Pediatric patients with atlantoaxial or occipitoatlantal instability frequently require surgical stabilization. However, the long-term consequences of atlantoaxial or occipitoatlantal fusion are unknown, particularly in children with a growing spine. Six to less than 9 years old.

Purpose of the study was to determine the long-term effects of atlantoaxial or occipitoatlantal fusion on growth and alignment of the cervical spine.

Methods: A retrospective chart review was conducted for patients less than or equal to 6 years old (mean = 4.7 years; range 1.7 to 6.8 years) undergoing OCF (either CT-2 or occipital-C2 fusion) at our institution within the last 10 years. Immediate postoperative plain radiographs and CT scans were compared with the most recent plain and dynamic radiographs to assess changes in spinal growth and alignment.

Results: Twenty-nine children met entry criteria for the study. The average length of follow-up was 21 months. Successful fusion was documented in all patients with plain films or CT scans. No evidence of juxtafo- cal subsidence, kyphosis, lordosis, osteophyte formation or long-term instability was seen. The overall growth and longitudinal alignment of the cervical spine was maintained. Seven patients with follow-up greater than 40 months were analyzed separately. Results similar to the main group were seen.

Conclusions Early follow-up suggests no increased risk for spinal deformity in children less than or equal to 6 years old undergoing atlantoaxial or occipitoatlantal fusion. Longer follow-up with measurements of the spinal canal will be necessary to determine precisely how this pediatric spine grow and remodels after such procedures.

12. MICRODISCECTOMY VS. CONSERVATIVE MANAGEMENT OF PEDIATRIC DISC DISEASE: OUTCOMES IN THE MODERN ERA

Kevin L. Stevenson, MD, Roger J. Hudgins, MD, William R. Baylotson, MD, PhD, Andrew Ransier, MD; Cathy Fyfe, PA-C (Atlanta, GA)

Introduction: Despite the fact that the literature contains several series of pediatric disc disease and its management, prior series exists in which every patient has been evaluated and treated in the modern MRI and microsurgical era. This study was undertaken to illustrate outcomes in pediatric patients with disc disease in the modern era.

Methods: 45 pediatric patients were treated for symptomatic disc disease between 1998 and 2003. A retrospective review of office and hospital records was conducted along with phone interviews for long-term outcomes analysis.

Results: Average age at presentation was 15.6 years. A precipitating event was noted in 60%. Back pain was a more common complaint than radiculopathy (95.6% vs. 73.9%) in both groups. 75% of surgical patients had documented evidence of a decline in school performance/attendance. 90% of surgical patients had complete resolution of their radiculopathy by postoperative day 14 with 85% reporting complete resolution of back pain. The surgical group returned to school by an average of 1.8 weeks. At long-term follow-up, no surgical patient complained of radiculopathy while 28.6% of the conservative management group had active radiculopathy. 12.5% of the surgical group experienced occasional back pain. The severe instability caused by the disc herniation was noted in 71.4% of this conservative management group. 100% of the surgical group had an excellent-good long-term outcome compared to 35.7% of the conservative management group.

Conclusions: This study represents the first analysis of pediatric disc disease management in the modern MRI and microsurgical era. In carefully selected patients, microdiscectomy is safe and effective treatment and is superior to prolonged conservative management.

13. MULTILEVEL CERVICAL DISC DISSECTION ANOLOGY - INITIAL DESCRIPTION, EMBRYOGENESIS AND MANAGEMENT

Kenneth Shulman Award Candidate

Paul Kim, MD, MPH; Richard Anderson, MD; Doug Brockmeier, MD (Salt Lake City, UT)

Introduction: A number of congenital spinal anomalies are unique to the cervical spine. Treatment is based on several factors, including the patient's anatomy and the surgical approach. After reviewing the current literature, we present three cases of a multilevel anomaly in which the pedicles are incompetent, thus creating a disconnect between the anterior and posterior elements. This disconnection resulted in severe instability that required immediate reduction and decompression if neural structures were being compromised. This anomaly has not been previously described.

Methods: The presentation, management and postoperative course of three children (2, 3 and 5 with multilevel incomplete pedicles are discussed. All patients presented with kyphosis and two with severe kyphosis and ventral spinal cord compression. The patients with kyphosis required reduction followed by the patient without with deformity underwent a posterior approach alone. All patients had improved neurologic function on follow-up. Based on the embryogenesis of the spine, we believe this anomaly arises as a result of failure of complete development of the neural canal, which eventually gives rise to the pedicle.

Conclusions: This represents the first description of a multilevel cervical anomaly in which there are maldeveloped or absent pedicles. The severe instability caused by the disc herniation is seen in all patients and kyphosis in two out of three. In general, the manage- ment principles include resection of the apex of the kyphotic and extensive stabilization, usually both anteriorly and posteriorly.

14. CT IMAGE SEGMENTATION AND 3-D RECONSTRUCTION FOR EVALUATION OF OCCIPITAL-CERVICAL INSTABILITY IN CHILDREN

Samuel R. Bowd, MD, PhD, Lindsey McNinch, Greg Jones, PhD, Douglas L. Brockmeier, MD (Salt Lake City, UT)

Introduction: Occipital-cervical (O-C) instability is commonly seen in children with Down's Syndrome. Dynamic imaging tech- niques such as flexion/extension views of the cervical spine are currently used to assess stability. We have developed a CT based image rendering technique to assess the O-C joint complex for morphologic changes that predict instability.

Methods: CT images of the O-C joint were obtained from 10 children with Down's Syndrome and 10 age-matched controls presenting for trauma evaluation. The 10 children consisted of 5 steel, contiguous sections were obtained and post-processed for image segmen- tation. Volumetric and linear measurements of the O-C complex were evaluated.

Results: Image segmentation provided 3D visualization of the O-C joint. Congential changes in the morphology of the O-C joint correlated with instability on flex- extension views.

Conclusions: High resolution CT imaging combined with new 3D rendering tech- niques allows for assessment of the O-C joint for morphologic changes that correlate with instability.

15. HIGH FREQUENCY RADIOSURGERY: SURGICAL ADJUNCT FOR LUMBARSPINAL LIPOMA RESECTION AND SPINAL CORD DETECTERING

Anders J. Cohen, DO; Jonathan S. Schwaeble, MD (New York, NY)

Introduction: High frequency radiosurgery has recently been introduced into the discipline. The paucity of headgear used at the surgical site allows for the surgeon to work in direct proximity to delicate struc- tures. A wide variety of electrodes provides more intraoperative versatility. We utilized this technology in an attempt to attain a more complete resection of lumbar spinal lipoma with accompanying tethered cord.

Methods: Over a five year period, 28 patients ranging in age from 6 months to 5 years were treated for clinical and/or radi- ographic evidence of tethered cord with accompanying intradural lipoma. Standard methods of lumbar laminectomy were used to expose the lumbar thecal sac. Various Radiosurgical electrodes were used to resect lipoma in proximity to nerve roots and conus. All procedures had intraoperative monitoring.

Results: Radical resection was achieved in all procedures. Nine patients had gross total resections that were confirmed by postoperative MRI. Ninety nine percent of patients demonstrated improvement in their neurological deficits were recorded. Pathology confirmed the diagnosis of lipoma in all patients. To date, no evidence of rethorossion has been observed.

Conclusions: High frequency radiosurgery can be a valuable adjunct in this venue where precision is mandatory. It greatly facilitated the dissection and removal of intradural lipomas. A significantly greater resection can be attained. This may result in a better outcome and reduce the incidence of future rethorossion.

16. CONSERVATIVE MANAGEMENT OF SPINAL LIPOMAS OF THE CONUS

Akhaya V. Kulkami, MD, PIRS (Toronto, ON); Mark R. Feener, MD; Michael Zerah (Paris, France)

Introduction: The natural history of spinal lipomas of the conus (SLC) has not been well-studied. Based on disappointing long- term results with early surgical management of asymptomatic children with SLC, we have followed a protocol of conservative management of these patients. The results are presented in this report.

Methods: Since 1994, all asymptomatic children with SLC seen at Necker-Enfants Malakids Hospital were subject to a protocol of conservative management. The records of these patients were reviewed to determine the incidence and timing of neurological deterioration. This was com- pared to a previously published historical cohort of asymptomatic patients who had received early surgery at our institution.

Results: Fifty-three asymptomatic children (36 girls, 18 boys) with SLC were followed with conservative management. During a mean follow-up of 4.4 years (12 months to 9 years), 13 (25%) patients developed neurological deterioration. At nine years, the actuarial risk of deterioration, based on the Kaplan-Meier method, for the conserva- tively managed patients was 33% and for the surgically managed patients was 46%. Using a Cox proportional hazards model, there was no significant difference in the risk of deterioration between those patients who were conservatively managed and those who received early surgery.

Conclusions: The incidence and pattern of neurological deterioration appeared to be very similar regardless of whether early surgery was performed. These results suggest that conservative management of asymptomatic patients is a reasonable option. A more definitive randomized study will be required to better clarify the relative efficacy of early surgery for SLC in asympto- matic patients.
17. THE NEED FOR A NEW THEORY OF LUPOMYOLOMENINGOCOELE FORMATION

N. J. Cummings, MD (Durham, NC)

Introductory current hypothesis on the formation of myelomeningocele is based on the assumption that during late
primary neurulation, premature disruption of the neuroectoderm from the surface
epidermis occurs allowing the ependymal
cells to invade the spinal cavity lining the neural tube. Using standard and developmental markers, we
analyzed resected lumbosacral spines and demonstrate that they cannot be sim-
ply derived from inactivated mesenchyme
that different into fat.

Methods: Immunohistochemical analysis
using standard and novel markers of
skeletal specimens of resected lumbosacral
tissue after myelomeningocele repair
was reviewed.

Results: Standard immunohistochemistry
revealed that tissue and cell types are
present, such as adipose, skeletal muscle,
smooth muscle, glia, fibroblasts, and blood
vessels in the resected lumbosacral tissue
must have been derived from several
embryologic origins. Novel developmental markers were analyzed to determine the identity of the
implantable cell mass tissue.

Conclusions: Modern embryologic data,
along with the results of immunohisto-
chemistry of resected lumbosacral tissues,
during myelomeningocele repair argues
for a new theory on the pathogenesis of
these lesions. Clearly, mesenchymal crisis,
cell lineal to adhesio tissue by default
does not explain the multiple tissues
and cell types seen in these lesions.
Several possibilities will be discussed.

18. SUPRA-PLACODE SPINAL CORD TRANCECTON FOR PARAPLEGIC
PATIENTS WITH MYELODYSPLASIA AND
REFRACTORY SYMPTOMATIC TETHERED
SPINAL CORD

Elizabeth C. Tyler-Kabara, MD, PhD; R. L. Tubb, PhD; P.-O. C., John C. Wallon III, MD; Jeffrey R. Blount, MD; W. Jerry Oakes, MD (Birmingham, AL)

Introduction The authors describe the
technique of transecting the upper spinal cord in
children born with myelomeningocele who have
undergone multiple dethorings and are
functionally paraplegic.

Methods: This technique involves identi-
fying the neural placode and sectioning the
normal spinal cord just superior to this site.

Results: No postoperative complications
have been identified in 14 patients under-
going this procedure for an 11 year time
frame. No patient at last follow up was
found to have symptoms referable to a
tethered spinal cord.

Conclusions: The advantage of this pro-
dure is to excise the normally non-protected
cord which is unrelated to the neural placode
which is often covered with scar tissue and
does not have the normal pia mater
surface linea predisposing it to the
frequent dorsal adhesions. We believe this
technique is of benefit in a small selected
population of myelodysplastic patients with
repetitive tethering of the spinal cord and
should be a part of the neurosurgeon's
armamentarium. The selectivity of this
procedure is stressed.

19. SPINAL CORD EPIDERMIDS
FOLLOWING NEURAL TUBE DEFORMATION:
MYELOMENINGOCELES: CLINICAL
CORRELATIONS AND FOLLOW-UP

Leslie N. Sutton, MD (Philadelphia, PA); Ian F. Pollack, MD (Philadelphia, PA); Gerald Tuttle, MD (St. Petersburg, FL); Arnold Menezes, MD (Iowa City, IA); Alan Lurie, MD (Philadelphia, PA)

Introduction Epidermoid inclusion cysts
have been reported to occur following fetal
epidermoid cord closure. The factors
leading to this phenomenon and its long
term clinical implications of this are
unknown.

Methods: Between March 1998 and
February 2003, 58 features underwent early
lumbar puncture closure of myelomeningoceles
at the Children's Hospital of Philadelphia.
Of the 34 survivors, 22 have had 
epidermoid inclusion cysts (11%). All have undergone surgery to remove the
epidemoidum, at four centers.

Results: The mean age at fetal surgery for
these six patients was 23 weeks, and the
mean age at delivery was 34 weeks, which
was no different from the group as a whole.
Estimated anatomic level of the lesion
ranged from L-2/L-3. Of the six, four had an
Alloderm dural graft, and two did not. All
patients were noted to have intact lower
extremity function to 51 at birth.
The mean age at time of diagnosis of
the meningocoele was 1.3 years. Four patients
did not achieve intact lower extremity function,
and two were asymptomatic. The meningo-
cele was found on surveillance MRI at age
for 3.8. One patient had a symptomatic recurrence of the epidemoidum,
and underwent reoperation at a time beyond
the 3.8 millimetre Law period. Two patients
have had their Coffin’s Law period without
recurrence and three have not yet reached
their Coffin’s Law period. All patients lost function as a result of the epidemoidum and the surgery, but
must have regained function with time.

Conclusions: Epidemoid formation may
occur following fetal surgery for
myelomeningoceles.

20. MYELOMENINGOCELES AND MECONION

Josephine Wyatt-Aulhorn, MD; Andrew
Parent, MD; John Landon, MD; Amanda
Ellis RN; James Boffil, MD; Steven Bagen,
MD; Alexandra Alexander, MD; Terence
Clayton, CK

Introduction We check whether effective electric
Cannion sections of babies with myelomeningoceles are effective in avoid-
ing factors that would prevent the splay-
open spinal cord elements in
myelomeningoceles, we examined the pla-
cents (diarms of the pregnancies) for
remnant meningocoele of babies undergoing myelomeningocele repair.

Methods: There were seven females and
one male. Initial age at diagnosis ranged
from prenatal (by image) to 16 years.
Operative correction was performed from
6 weeks to 14 years of age. The four patients
with associated abdominal wall defects (CECS
Complex - cephalocele, encephalocele, cystic
blanket, imperforate anus, spiral defects),
are significantly handicapped, two are wheelchair
bound, two are at home and receiving medical
and all have spastic incontinence. The four
patients without abdominal defects are fully
ambulatory, one with an ankle foot orthosis,
one patient has normal sphincter function,
the other are on intermittent mean
catheterization. No patient has
hydrocephalus or Chiari malformation.
It is concluded that these two subsets have
similar clinical course. Prenatal and postna-
urally performed urologic and urodynamic
testing in relation to outcome, has to
be directed by the presence or absence
of abdominal wall defects.

Conclusions: It is concluded that patients
with terminal myelomeningocele without
abdominal wall defects have a more
favorable neurological outcome when com-
pared to those with ventral wall defects.

22. FALLING CSF SHUNT RATES FOR
MYELOMENINGOCELE IN CANADA

Patrick J. McDonald, MD, FRSC(C);
(Winnipeg, MB); Candace D. Johnson, MD; Maria Bernat-Pasculli, RN;
Jenn carlos; T. Scrivalli, MD, FRSC(C); Robin P.
Humphreys, MD, FRSC(C); Peter B. Oates, MD, FRSC(C); (Toronto, ON, Canada)

Introduction Historically, up to 80% of
infants born with a myelomeningocele.
(MMC) require CSF shunts to manage
hydrocephalus. The incidence of MMC has
declined in the past decade at our institu-
tions and we hypotetize that the neurosur-
gical management of MMC patients also
changed.

AIM: To determine if current MMC patients
have the same CSF shunt insertion and Chiari
decompression rates as in past decades.

Methods: We reviewed our surgical data-
base for patients with MMC over the time
and determined how many patients required
CSF shunts and Chiari decompressions. All
patients had MMC repair, shunt insertion,
and clinical followup at either the Hospital for
Sick Children or Winnipeg Children's
Hospital. Follow-up is through June 2002.

Results: From 1980-89, out of 351 MMC
patients repaired, 269 (77%) had CSF shunts and 45
(13%) required Chiari decompression.
From 1990-99, 160/255 (63%) MMC patients
required shunts and 16/255 (6%) had a
Chiari decompression. In 2000-02, 15/25
(62%) MMC patients had CSF shunts and 7/25
(28%) had Chiari decompressions.

Conclusions: In the year 2004, a child born
with a MMC is less likely to have either
VP shunt inserted or a Chiari decompression
than in the past. This may reflect either a
change in the characteristics of the
population, or in management philosophy.
These new rates of shunt and Chiari
decompression may have important
implications when considering the utility
in using MMC repair as a means of lowering
the historical rates of shunt and Chiari
decompression.

23. FAMILIAL RELATIONSHIP BETWEEN
CHIARI I AND I

Kenneth Shultman Award

Rahul Motfakkar, MD (Mackin, WI);
Mary C. Spier, MD; R. Shane Tubb, MD;
W. Jerry Oakes, MD (Birmingham, AL);
Bennar J. Iskandar, MD (Mackin, MI)

Introduction Chiari-6 describes a patho-
physiological process at the foramen mag-
num that causes syringomyelia, but without
tonialis effect. As with Chiari-1, decom-
pression of the posterior fossa of patients
with Chiari-6 results in resolution of the
syndrome. In this report, we examine a possible genetic
link between Chiari-1 and Chiari-6.

Methods: Families were recruited for
these study through a proband in whom Chiari-1
without or with syringomyelia had been
documented or NINDS. Individuals with
syndromic, traumatic, or tumor-related
causes were excluded. All medical records
and MRI images were reviewed.

Results: We identified five pedigrees in
which first-degree relatives of the Chiari-1
patient (proband) had syringomyelia with
out or with neurosurgery. Chiari-6. The
clinical presentation of three, and the
syndrome location in four of the Chiari-6 subjects was
almost identical to those of their respective
Chiari-1 relatives. Impaired swallowing or
the posterior fossa decompression occurred in
both Chiari-1 and Chiari-6 patients and three of
the four Chiari-6 cases had a Chiari-1
synonym.

Conclusions: Familial clustering of Chiari-6
and Chiari-1 is demonstrated in five
pedigrees. Familial clustering can be due to
unknown environmental causes or although
known "environmental" causes for Chiari-1
were excluded, and each condition is
 uncommon enough that co-occurrence
in families would be rare. We
 demonstrate that Chiari-6 and Chiari-1
certain clinical and anatomical characteristics; they
are associated with syringomyelia, and
the syndrome responds to posterior fossa
decompression. Our results suggest that
Chiari-6 and Chiari-1 are related by a common
pathophysiological mechanism, perhaps
due to an underlying genetic basis, and that
tonsilar herniation is not essential for the
occurrence of a Chiari pathophysiology.
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24. POSTERIOR CRANIAL FOSA VOLUME IN PATIENTS WITH RICKETS: INSIGHTS INTO THE INCREASED OCCURRENCE OF CHIARI I MALFORMATION IN METABOLIC BONE DISEASE
Elizabeth C. Tyler-Kabara, MD, PhD, R. S. Taylor, MD, PA-C, John C. Welleto III, MD, Jeffrey P. Blount, MD, W. Jerry Oaks, MD, (Birmingham, AL)

Introduction: Some have proposed that the calvarial thickening seen in patients with rickets results in an increased rate of Chiari I malformation in these patients. The current study measures the posterior fossa volume in children with rickets in order to verify previous case reports indicating a small posterior fossa as the etiology for an increased rate of Chiari I malformation in children with rickets.

Methods: Patients were chosen using a computer database to search for individuals diagnosed with rickets. Nineteen patients were identified with this diagnosis. Seven patients were found from this cohort to have imaging of the head. Axial CT and MR images were then analyzed using the Cavalier method to define posterior fossa volumes. These data were then compared to age-matched controls.

Results: Mean volumes of the posterior fossa were significantly reduced in all patients compared to age-matched controls (p < 0.0001).

Conclusions: We have found that the volume of the posterior fossa is significantly smaller in children with rickets versus age-matched controls. Further, 29% of our study group had an associated CIM. This data will hopefully aid in the further understanding of the pathophysiology of CIM in cases of metabolic bone disease.

25. AUTOIMMUNE-IMPLICATED SHUNT CATHETERS DECREASE THE INCIDENCE OF SHUNT INFECTION IN THE TREATMENT OF HYDROCEPHALUS

Hydrocephalus Award Candidate
Daniel M. Scobie, MD, R. M. Stewart, BA, Matthew J. McGrath, MD, Graeme F. Woodworth, BS, Ameer F. Samandi, MD, Benjamin Canvin, MD, George J. Jallo, MD (Baltimore, MD)

Introduction: Most shunt infections occur within six months of shunt placement and chiefly result from perioperative colonization by skin flora. Antibiotic-impregnated shunt catheters (AIS) systems have been designed to prevent such colonization. In this study, we evaluate incidence of shunt infection after introduction of an AIS system in a pediatric hydrocephalus population.

Methods: We retrospectively reviewed all pediatric patients undergoing CSF shunt insertion at our institution over a three-year period. All patients were evaluated by an AIS system from October 2002 to October 2004. CSF shunts included standard, non-impregnated shunt catheters. During the 18 months following October 2002, CSF shunts included antibiotic-impregnated shunt catheters. Patients were followed for six months after surgery, and all shunt-related complications including infection were evaluated. The independent association of antibiotic-impregnated shunt catheter use with subsequent occurrence of shunt infection was assessed via multivariate proportional hazards regression analysis.

Results: 176 pediatric patients underwent shunt surgery. 181 (96%) shunts were placed with non-impregnated catheters prior to October 2002, 144 (44%) shunts were placed with antibiotic-impregnated shunt catheters after October 2002. Sixteen (9%) patients with non-impregnated catheters experienced shunt infection, whereas only three patients with antibiotic-impregnated catheters experienced shunt infection within the six-month follow-up period, p = 0.026.

Conclusions: Antibiotic-impregnated shunt catheters, adjusting for inter-cohort differences via multivariate analysis, were independently associated with a 3.5 fold decreased likelihood of shunt infection.

Results: Sixty-nine patients from 10 centers were followed for a mean of seven months. Reinfec tion occurred in 15 patients (25%). Of the 15 reinfected patients, five were infected with the same organism and five with new organisms. Treatment time varied from three to 47 days with a mean time of 14 days for those who later got reinfe cted and a mean of 14 days for those who did not. The initial management was shunt externalization in 14 patients, shunt removal and external ventricular drain insertion in 43 patients and antibiotics alone in one patient.

Conclusions: We have identified a group of infants under 7 years of age with obstructive hydrocephalus to be a target of a multi-center, prospective, randomized study on the yield of endoscopic third ventriculostomy versus conventional shunt (IHS). We have decided to concentrate on long-term, neuro-behavioral results as our primary outcome measure. The paper will present the study design, and update current issues of organizing such a large scale international cooperation.

27. THE MANAGEMENT OF SHUNT INFECTION: A MULTICENTER PIL OT STUDY

John R. W. Keefe (Salt Lake City, UT), Hugh Garton (Ann Arbor, MI), William Whitehead (Indianapolis, IN), Jaimal Dasra, Abhaya Kulkarni (Toronto, ON, Canada)

Introduction: Approximately 10% of cerebrospinal fluid (CSF) shunt operations result in infection and require removal/revision or de novo insertion of the shunt, antibiotics (in hospital), followed by insertion of a new shunt. In this prospective, single-center study, we investigated the duration of antibiotic therapy and the current multicenter pilot study was undertaken to evaluate variability in the management of shunt infection.

Methods: Patients were entered if they had a culture proven CSF shunt infection. Details were collected and the incidence of culture proven infection were recorded.

Results: Pressure Head 934.9±26.7
5cmH2O 10cmH2O 15cmH2O
480±40 800±80 1080±100

Conclusion: By preventing cells from permeating the catheter wall it is thought that the rate of proximal catheter obstruction can be significantly limited. Our approach in using a CA porous membrane was to prove the feasibility of obtaining acceptable flow rates across a permeable membrane. Future materials need not involve CA but may be derived from other "insert" materials instead. The CA filter in our experiments provided for good flow but also had an increased potential for trapping debris. Although further in vivo testing is necessary, the design concepts presented in this paper may contribute in improving the way we prevent proximal catheter obstructions.

29. PROGRAMMABLE VERSUS FIXED- PRESSURE VALUES FOR THE TREATMENT OF HYDROCEPHALUS IN CHILDREN

Chris Hallak, MD, Mark D. Kruger, MD, David I. Sandberg, MD, Bryan C. OH, MD, J. Gordon Mc комber, MD (Los Angeles, CA)

Introduction: Our objective was to assess the treatment of progressive multiloculated hydrocephalus by cranioventriculostomy for microsurgical fenestration of cerebrospinal fluid (CSF) compartments in order to reduce the number of ventricular catheters.

Methods: We studied 33 pediatric patients who underwent craniosynostosis for fenestra tion of progressive multiloculated hydroceophalus between 1997 and 2003. In 20 patients, hydrocephalus was attributed to intraventricular-periocular, pleural, or abial shunt or shunt revision involving valve replacement over an eighteen-month period.

Results: Ninety-nine children in the "Delta" group received Medtronic Delta valves with non-adjustable pressure settings. Ninety-eight children in the "Strata" group received Medtronic Strata programmable valves.

Shunt survival, infections and valve adjustment were tabulated.

Results: The "Delta" and "Strata" groups had similar rates of revision (15 of 99% and 15 of 98% respectively). Postoperative shunt infection (5 of 99% and 8 of 98% respectively). Five patients in the "Strata" group required increased pressure adjustments for symptoms of over or under drainage, but three of these patients subsequently required sur gical revision. Three patients had their valve settings changed by MRI with allergic symptoms including bradycardia and pos turing. All recovered fully with reprogramming of their valves. We also noted increased metallic artifact on MRI with the programmable valves, which impaired imaging of the posterior fossa.

Conclusions: Ninety-eight programmable valve placements were therapeutically efficacious in two patients, but caused serious problems after MRI in three patients and impaired MRI imaging in others. We did not find a significant advantage in using programmable shunt valves to offset the higher cost, post-MRI wet problems, and effect on MRI quality.

30. CRANIOOTOMY FOR FENESTRATION OF MULTILOCULATED HYDROCEPHALUS IN CHILDREN

David I. Sandberg, MD, J. Gordon Mc комber, MD, Mark D. Kruger, MD (Los Angeles, CA)

Introduction: Our objective was to assess the treatment of progressive multiloculated hydrocephalus by cranioventriculostomy for microsurgical fenestration of cerebrospinal fluid (CSF) compartments in order to reduce the number of ventricular catheters.

Methods: We studied 33 pediatric patients who underwent craniosynostosis for fenestration of progressive multiloculated hydrocephalus between 1997 and 2003. In 20 patients, hydrocephalus was attributed to intraventricular-periocular, pleural, or abial shunt or shunt revision involving valve replacement over an eighteen-month period.

Results: Ninety-nine children in the "Delta" group received Medtronic Delta valves with non-adjustable pressure settings. Ninety-eight children in the "Strata" group received Medtronic Strata programmable valves.
31. PHASE II TRIAL OF CONFORMAL RADIATION THERAPY FOR PEDIATRIC PATIENTS WITH CRANIOPHARYNGIOMA AND CONGENITAL ORACULAR DYSOS: WEBOUSE WITH CHANGE IN COGNITIVE FUNCTION

Thomas Merchant, DO, PhD, Erin Kehma, MD, MC, Andrew M. Mahnken, PhD, Cheng Hong Li, MD, Xiapeng Xiong, MD, Fredrick Boop, MD, Robert A. Senford, MD, (Memphis, TN)

Introduction: The best treatment for craniopharyngioma in children remains debatable, both surgical resection and limited surgery plus radiation result in approximately 85% cure. The debate centers on quality of life. The senior author reported (AANS 2002) a 10 point decrease in SED score in patients treated from 1983-1997 with standard radiotherapy.

Methods: In a prospective study (July 1997 - January 2003) 28 pediatric patients received conformal radiation therapy (CRT) with a 1 cm margin accompanying the solid tumor and cyst. The children were serially evaluated with neuropsychometric testing. They were divided according to age and type of surgery. Group A: CRT plus extensive surgery with an intent for cure. Group B: Limited surgery (nerve decompresion or cyst drainage).

RESULTS: Multiple varia analyses revealed that cognitive outcome was adversely affected more in Group A (p=0.028). 23 surgical procedures (p=0.008), age 7.7 years or youngers (p=0.010), and 24 hours irradiation (p=0.016) present at diagnosis (p=0.38). Other negative factors included diabetes diagnosed before CRT, nonalminized midline tumor, multiple recurrent, and multiple cyst resection. These results will be compared to the 40 children treated without CRT. Twenty-eight of 33 patients were severely delayed and 4 were mildly delayed.

Conclusions: Craniosynostosis for conformation of loculated CSF compartments can effectively treat multiloculated hydrocephalus and can enable most patients to avoid multiple shunt catheters.

32. CONVECTION AND DIFFUSION DISTRIBUTION PATTERNS OF ANTI-GLOMA MONOCOINAL ANTIBODY B9H 2 IN THE BRAIN FOLLOWING INTERSTITIAL INFUSION.

Kenneth Shulman Award Candidate

Neel Luther; William J. Rudy, Nai-Kong Chuang, MD, PhD, Philip H. Gutin, MD, Mark M. Souweidane, MD, New York, NY

Introduction: High-grade gliomas constitute 15% of primary pediatric CNS malignancies. Monoclonal antibody (Mab)-mediated immunotherapy has utility in clinical treatment. Mabs bind to over 85% of gliomas without cross-reactivity to normal brain. Immunotherapy of invasive gliomas relies on delivery that bypasses the BBB, achieving high local antibody concentration and distribution in tumor and normal brain. Previous work demonstrated large volumes of distribution (Vd) of B9H2 can be achieved in the brain via interstitial infusion, a delivery method utilizing built fluid and distribution and uniformity.

Methods: Stereotactically-guided interstitial infusion of biocytinated B9H2 into the striatum was performed in 24 rats. Dose and volume of infusion were independently varied. Animals were sacrificed 1, 24, or 72 hours following infusion to determine B9H2 distribution. Results: Multiple varia analyses revealed that cognitive outcome was adversely affected more in Group A (p=0.028). 23 surgical procedures (p=0.008), age 7.7 years or younger (p=0.010), and 24 hours irradiation (p=0.016) present at diagnosis (p=0.38). Other negative factors included diabetes diagnosed before CRT, nonalminized midline tumor, multiple recurrent, and multiple cyst resection. These results will be compared to the 40 children treated without CRT. Twenty-eight of 33 patients were severely delayed and 4 were mildly delayed.

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Conclusions: Craniosynostosis for conformation of loculated CSF compartments can effectively treat multiloculated hydrocephalus and can enable most patients to avoid multiple shunt catheters.
37. CUMULATIVE INCIDENCE OF RADIATION-INDUCED LESIONS OF MAGNETIC SUSCEPTIBILITY IN CHILDREN WITH MEDULLOBLASTOMAS

Sean Lew, Joseph N. Morgan, MD, Etete Pattey, Daniel R. Latson, MD, Jeffrey Allen, MD, Rick Abbott, MD (New York, NY)

Introduction: Radiation necrosis is a common pediatric neurosurgical procedure. Although deficits associated with such surgery are increasingly discussed as radiobiology of post-surgical injury, the incidence of dysfunction from injury to normal cerebral structures is unknown. This study reviews the postoperative oculomotor and vestibular-oculofindings in these patients.

Methods: Fifteen patients with medulloblastoma tumors (medulloblastomas, astrocytoma, and ganglioglioma; mean age 10y) were studied following surgery involving the vermis. Patients underwent quantitative eye movement recordings using binocular video-oculography to evaluate gaze holding and conjugate eye movements (saccades, smooth pursuits, full field optokinetic nystagmus).

Results: All 15(100%) had abnormalities of gaze holding or some aspect of conjugate eye movement. Dysfunctions in gaze holding in the dark were always seen, with a quick loss of fixation often not apparent in the light. Disrupted saccades with both nygmatism or missing targets were seen. Dysmetric saccades, including hypermetric saccades, with overshooting of targets were eventually investigated by repeated, shortening saccadic attempts. Hypometric saccades that undershoot the target were also seen. These various ocular movements defined by both to lead to difficulty reading and complaints of blurry vision when viewing motion.

Conclusions: Patients display a wide range of oculomotor and vestibular-ocular deficits following resection of posterior fossa tumors, presumably due to injury to vestibulo-ocular structures. These deficits are not only evident on objective testing, or routine visual examination, and are likely to have impact on routine school and later life activities. Oculomotor testing is now part of our routine post-operative clinical evaluation.

39. SUPRAOCULAR APPROACH FOR ANTERIOR CRANIAL FOSSA LESIONS IN CHILDREN

George J. Jallo, MD (Baltimore, MD); Laksh Bognar, MD (Budapest, Hungary)

Introduction: There are many surgical approaches for lesions situated within the anterior cranial fossa and/or suprasellar region. The frontotemporal keyhole approach is a minimally invasive approach for these lesions in children.

Methods: We report a series of 31 children that were operated upon at our institutions between 1998 to 2004, using this approach. The child ranged in age from 6 to 12 years (mean, 9.2 y). The duration of follow-up ranged from 3 to 60 years (mean, 20.5 y). All the children underwent an unilateral supracyclocle incision and a keyhole craniotomy. The lesions were located in the suprasellar or anterior cranial fossa. The histology consisted of craniopharyngioma, optic gliomas, hypothalamic hamartomas and arachnoid cysts. The operative corridor was adequate for all cases except one for which a traditional craniotomy was performed. There were no untoward complications associated with the approach. There was only one infection which required reoperation and debridement.

Conclusions: Our study supports the utilization of this approach for certain lesions. There is no morbidity increased as compared to conventional craniotomies in children.

40. USE OF LUMBAR SHUNT IN MANAGEMENT OF PATIENTS WITH SUL TUMOURS AND HYDROCEPHALUS: A COMPARISON BETWEEN VENTRICULAR SHUNT MALFUNCTION Sandeep Sood, MD; Tiffany Powell, BS; Ryan Barrett, DO (Detroit, MI)

Introduction: Chroniclly shunted patients can often present with acute deterioration and persistent small ventricles despite shunt malfunction. Lumboperitoneal shunt (LPS) have been utilized in the correlation with some success. We address the long term outcomes in this study.

Methods: Thirty-three patients who present with ad lit ventricles and recurring cluster malfunctions were converted to a LPS at mean age of 12 years. Initial ventriculoperitoneal shunt (VPS) was placed at a mean age of 16.5 months. Ten patients with obstructive hydrocephalus had an endoscopic third ventriculostomy, while four with an isolated ventricle who had failed endoscopic fenestration required a ventricular shunt in addition to the LPS. The number of LPSs placed and improvements during follow-up were compared to the same for VPS over the same number of months prior to LPS conversion.

Results: Twenty-three of the 33 patients were successfully converted only LPS and data from 24 were available for analysis. There were 4.88 malfunctions and 0.50 infections for VPS and 1.17 malfunctions and 0.63 infections for LPS during a mean follow-up of 17 months. There was a statistically significant p<0.0001 reduction in the rate of malfunction after conversion to LPS, where no statistical difference in the number of infections (p = 0.501) was observed. No case presented with LPS and definite function of a LPS and none had symptoms suggesting development of a Chiari Malformation.

Conclusions: Conversion to LPS is a safe and effective treatment option in the patients prone to rapid decompenasion and frequent ventricular shunt malfunctions secondary to small shunt-like vectors.

41. DIAGNOSIS AND MANAGEMENT OF PEDIATRIC PSEUDOTUMOR CEREBRI

Frederick A. Boop, MD, FACS, Robert A. Sanford, MD, Stephen Dirks, MD, James D. MDCS; Michael Multhaup, MD (Memphis, TN)

Introduction: Recent data shows an alarming rise in obese children. Pseudotumor cerebri, an associated complication, has shown a parallel increase in incidence. This retrospective review demonstrates the relevant features of pseudotumor cerebri in a pediatric population, reviews our approach to the disease, and reviews available treatment strategies.

Methods: A retrospective chart review was performed on 25 patients who presented to the pediatric neurosurgery service at LeBonheur Children's Medical Center from 1997 to July 2004.

Results: Of the 25 patients, the mean age at presentation was 10.9 years. There were 3.3 times more females diagnosed. Chi-square test was present in 82% of females and 14% of males. Secondary stenologies included unilateral transverse sinus thrombosis in three, occipital venous collaterals in two, secondary to medications in three, and idiopathic in the remainder. The most common presenting symptom was headache. A formal ophthalmological examination revealed papilledema in 100% and decreased visual acuity in 39% of the patients. Each individual underwent a lumbar puncture, computed tomography imaging, and magnetic resonance imaging including venography. Medical management was pursued initially in all patients. Two children initially underwent optic nerve sheath fenestration, both with significant improvement and no further deterioration in vision. Twenty one percent of children ultimately required a permanent VP shunt.

Conclusions: Pseudotumor cerebi in childhood is being diagnosed with increasing frequency. Obesity, sinus thrombosis, medication side-effects and other etiologies must be ruled out. When properly managed, only a small percentage of children presenting with pseudotumor cerebri will require shunting.

42. GENETIC INFLUENCES DRIVING THE CEREBRAL AQUEDUCT IN CONGENITAL HYDROCEPHALUS

Hydrocephalus Award Candidate
Janet M. Miller, PhD, Gary S. Krauss, MD, Steven D. Hema, DO, James M. Allbritton II, PhD (Detroit, MI)

Introduction: To elucidate the pathogenesis of congenital hydrocephalus, we identified specific genetic components influencing closure of the cerebral aqueduct in the H-Tx rat.

Methods: Midbrain regions were micro-dissected from five hydrocephalic and five control animals at 5 days of age. After RNA extraction, cDNA was subjected to PCR techniques, labeled and hybridized (or "probed") to either arrays of 22500 oligonucleotidic acid from Affymetrix. Hybridization intensity for each array was measured using a confocal scanner, and results were normalized and reported as fold change differences. Raw expression data were subjected to a normal test as well as the Bayesian t-test method, a test that helps control for variations resulting from FDRs. Only those transcripts passing both the fold change and t-test cutoffs were examined further.

Results: Forty-seven transcripts passed significance for both t-tests and a fold change cut-off of 1.5. Some of these altered genes correlated with earlier studies of hydrocephalus. For example, animals deficient in Nuclear Factor 1 showed a similar sequence of events leading to a corpus callous and demonstrate ventriculomegaly, and this gene was down regulated 58-fold in the H-Tx midbrain. Also, in adult human patients, cholesteotpipin levels are reduced, and hydrocephalic H-Tx rats exhibit a 1.7 fold reduction in expression of this gene.

Conclusions: These results suggest that gene alterations in the midbrain may cause aqueductal stenosis in this model. Identification of these genes provides direction for further studies that attempt to reduce the occurrence of this disorder in humans.
4. CAN THE SKULL DIPLOIC SPACE BE UTILIZED FOR ABSORPTION OF CEREBROSPLINAL FLUID?

Hydrocephalus Award Candidate
Jeffrey Fugh-Berman, MD, Keith Aronin, MD (Edmonton, AB, Canada)

Introduction Various sites have been utilized for the diversion and absorption of CSF since the late 1980s. Absorption of CSF through the cranial diploe represents an alternative site for CSF diversion.

Methods An intracranial injection device was developed for accessing the cranial diploe. Glucose and Technetium 99m were infused into mixed branch commercial pigs to study the absorption in an acute animal model. Systemic uptake was determined from serial samples taken from an indwelling central venous catheter. The calvarium was removed at the conclusion for the study for anatomical examination. Results There was a rapid, significant rise in serum glucose measured from the femoral vein in all animals, from 66.25 mg/dL (95% CI 44.69 - 87.01) to 104.5 mg/dL (95% CI 101.0 - 108.0) following calvarial infusion of D5W. The Technetium 99m infusion confirmed the rapid and reliable absorption of fluids through the cranial diploe. Conclusions Current management of hydrocephalus is not based on decreasing normal CSF flow patterns from the brain to the dural venous system. It represents an intervention and complex hydrodynamic factors on an already complicated hydrodynamic disorder. Intracranial injection through the skull may represent a potential pathway to divert and absorb CSF, creating a shunt system that would better restore a physiologic condition for CSF absorption.

45. COMPUTED TOMOGRAPHY BASED VENTRICULAR VOLUME MEASUREMENT IN RADIOGRAPHICALLY OCCULT SHUNT MALFUNCTION

Priya Reddy, MD, Paul A. Maruhi, MD, Dennis Rivet, MD, Jeffrey R. Leonard, MD, Tae Sung Park, MD, Ben Lee, MD, Matthew D. Smyth, MD (St. Louis, MO)

Introduction Routine imaging studies may not support the diagnosis of a shunt malfunction. We studied this by using the usefulness of measuring supratentorial computed tomography (CT)- based ventricular volumes in children with radiographically occult, documented shunt malfunction.

Methods A retrospective review over four years of all children who underwent shunt revision or shunt placement was performed. Patients with a documented shunt malfunction and whose shunt function was assessed were studied.

Results Median age was 4.5 years (range 0.5 years to 13.15 years). The mean ventricular volume was 99.7 mL/EC (95% CI 58.4 mL/EC to 152.5 mL/EC).

Conclusions This is a rapid and objective method to assess intracranial volume in children with radiographically occult shunt malfunction.

46. CHEMICAL ANALYSIS OF FLUID OBTAINED FROM INTRACRANIAL ARACHNOID CYSTS IN PEDIATRIC PATIENTS

David I. Sandberg, MD, J. Gordon McCord, MD, Mark D. Krieger, MD (Los Angeles, CA)

Introduction The chemical composition of intracranial arachnoid cyst fluid was analyzed to gain better understanding about potential causes of cyst growth.

Methods We studied 54 pediatric patients who underwent craniotomy for arachnoid cyst fenestration between January 1994, and June 2003. CSF fluid analysis was performed, and results were compared with expected values for cerebrospinal fluid (CSF).

Results Median values for arachnoid cyst fluid protein were significantly different when compared to ten normotensive children. Median values for protein for median 37.0 mg/dL, mean 17.82 mg/dL, expected value 25.6 mg/dL, ±0.025 mg/dL (median 25.6 mg/dL, expected value 2.88 mg/dL, p = 0.004), and osmolality (median 284 mOsm/L, ±0.016 mOsm/L: median 284 mOsm/Kg, p=0.001). Median values for arachnoid cyst fluid protein were significantly different from expected CSF values ±0.016 mg/dL (median 140.00 mg/dL, expected value 143.3 mg/dL, p=0.025) or chloride (median 122 mg/dL, expected value 123.3 mg/dL, p = 0.268). Median glucose was 51 mg/dL. Median cyst fluid white blood cell (wb) count was 1 per cubic mm, and median red blood cell (rbc) count was 1.5 per cubic mm. All gram stains and cultures were negative. No correlations were found between arachnoid cyst fluid protein level and elevated rbc count, patient age, or subsequent requirement of a shunting procedure. Elevated arachnoid cyst fluid rbc count also was not associated with subsequent need for shunting.

Conclusions Arachnoid cyst fluid has a chemical composition different from normal CSF, but some arachnoid cysts have elevated protein levels. We hypothesize that elevated protein content may contribute to arachnoid cyst expansion in some patients.

47. ELEVATION OF CRP IN THE CEREBROSPLINAL FLUID OF MYOLOBALANUS DISGUINNENS

Sang-Yeon Kim, MD, PhD, Joo-Young Yoo, Byung-Kyu Cho, MD, PhD, Soon-Jin Hong, Yong-Kook Kim, Jung-As Moon, Ji Ha Kim, MD, You-Nam Chung, MD, PhD, Kyu-Chang Wang, MD, PhD, Seoul (Republic of Korea) Introduction The etiology of myxomatous aortic valve disease is not well understood. This study was undertaken to identify specific proteins associated with the pathogenesis of MWD.

Methods We studied cerebrospinal fluid (CSF) samples obtained from 36 patients with confirmed MWD (6 boys and 10 girls, age range 3-13 years, mean 7.75 years) and four control subjects with no evidence of underlying systemic dossal rhabdomyosis (two boys and two girls, age range 5-10 years, mean 7.10 years). CSF samples were analyzed by two-dimensional polyacrylamide gel electrophoresis and protein identification was performed by Matrix-assisted laser desorption/ionization-time of flight mass spectrometry. The presence of specific CSF proteins in patients with MWD was confirmed by Western blotting. In addition, cerebral CSF was also tested in seven patients who had other brain diseases but no MWD (two boys and five females, age range 1-12 years, mean 6.9 years).

Results We identified one polypeptide spot Mr = 15.15 kDa (Mr 5.56 kDa) differentially expressed in the CSF samples of MWD patients (mean OD intensity: 0.36±0.28, range: 0.05 to 0.19) and control spinal CSF samples (mean 0.03±0.04, range: 0.08, p=0.002). This polypeptide was identified as cellular retinoic acid binding protein (CRABP-1). High levels of expression of CRABP-1 in the CSF from 17 MWD children were confirmed by western blotting.

Conclusions The analysis of the CSF of MWD patients reveals high CRABP-1 expression. The present study suggests that the elevation of CRABP-1 in CSF may be a candidate for pathogenesis of MWD.

48. PEDIATRIC INTRACRANIAL ANEURYSMS: DURABILITY AND TREATMENT FOLLOWING MICROSURGICAL AND ENDOVASCULAR MANAGEMENT

Kenneth Shulman Award Candidate
Nader Sanai, MD, Alfredo Quinones-Hinojosa, MD, Nalin M. Gupta, MD, Charles B. Wilson, MD, Victor E. Perry, MD, Michael L. Lawton, MD (San Francisco, CA)

Introduction Intracranial aneurysms in children are rare; their outcome after treatment is poorly described. We review the UCSD experience in patients treated from 1977 to 2003, focusing upon treatment durability.

Methods We identified 32 pediatric patients with 43 aneurysms treated, ages 2 months to 18 years (mean 11.7 years) and male:female ratio 14:10. Inpatients, clinic, and computer records were reviewed. Patients were followed by telephone interview. Mean follow-up was 5.67 years (range 1 month -18.0 years).

Results Seven patients presented with subarachnoid hemorrhage (SAH) and one without (4 from Grade I, four from Grade II, one from Grade III and one Grade IV). Aneurysm locations included:

- internal carotid artery (N=13), middle cerebral artery (N=11), and basilar artery (N=6).
- Seventeen patients had ruptured aneurysms (N=25.0m). Thirteen were treated surgically, 16 endovascularly, and three patients were managed with observation. Two patients demonstrated spontaneous thrombosis of their aneurysms, but these subsequently recanalized and were treated with coiling. No patients died from treatment and two surgical patients developed new, permanent neurological deficits.

In three patients, endovascular therapy resulted in incomplete obliteration. Three aneurysms recurred following endovascular treatment. In all but one case, surgery resulted in complete aneurysm obliteration and no evidence of a surgically treated aneurysm recur.

Conclusions Surgery and endovascular therapy can safely treat pediatric aneurysms. In this study, endovascular intervention demonstrated significantly higher rates of incomplete treatment and aneurysm recurrence. Considering the long life expectancy for this population, careful patient selection is needed, despite parent bias towards non-operative approaches.

49. MICROSURGICAL TREATMENT OF PEDIATRIC ANEURYSMS: MALFORMATIONS: RECENT UCSF EXPERIENCE

Kenneth Shulman Award Candidate
Ronald J. Cane, MD, Rafael Mejia, MD, Arvind Chandra, MD, Sivana Chennappanavar, AB, MS (Berkkeley, CA); Nalin Gupta, MD, PhD, Victor Perry, MD, Michael W. McDermott, MD, and Michael L. Lawton, MD (San Francisco, CA)

Introduction AVMs have an incidence of 1/1000. Pediatric patients account for 10%. We evaluate our experience with pediatric intracranial aneurysms.

Methods A retrospective chart review of 38 consecutive pediatric patients who underwent microsurgical treatment of AVMs at UCSD between 1997-2003 was performed. Clinical and imaging data were reviewed and were evaluated with respect to radiographic cure, neurological examination, and Glasgow Outcome Scale.
Results Thirty-eight patients with a mean and median age of 13.3 ± 5.4 and 14 years, respectively, underwent microvascular treatment between 1997-2003. Twenty-seven (71%) patients presented with AVM rupture. Using the modified Spalter-Larin Minimum AVM scale our series consisted of four (10.3%), grade I, five (12.0%), grade II, four (10.3%), grade III, two (5.4%), grade IV, and no V. The most common symptom was headache, followed by seizures, nausea and decreased consciousness. Two patients with residual disease had complete radiological cure after postoperative stentBNG radiosurgery. There were no deaths in our series. Mean follow-up was 13.5 months. Frontal (36.3%) AVMs were the most common followed by temporal (26.5%) and cerebellar (18.4%). Illustrative cases for AVMs in different anatomical locations are presented.

Conclusions We present our experience with pediatric AVMs which is extensive. As we demonstrate here favorable outcomes can be obtained in all pediatric patients with AVMs including grade IV and V.

50. DELAYED REPAIR OF SCAPHOCAPHLHY: SIGNIFICANCE OF INTRAOPERATIVE MORPHOLOGICAL ASSESSMENT Robert F. Keating, MD, Jonathan Martin, MD, Michael Boyan, MD, Jeffrey Pavlik, MD, MD, Derek Bruce, MD, (Washington, DC)

Introduction: In previous reports that up to 8% of children with scaphocephaly may manifest increased intracranial pressure, few clinicians today observe intracranial hypertension after single-stage craniosynostosis. Clinical experience with older scaphocephaly patients at our institution, demonstrate a lack of significant number of individuals manifesting increased intracranial pressure, confirmed by intraoperative assessments.

Methods: Over a seven year period, 73 patients underwent scaphocephaly surgery. Fourteen patients (11 males/3 females) presented after 15 months of age (10±0-9, 8±0-79). None were syndromic nor had hydrocephalus. Patients were evaluated clinically for elevated ICP, papilledema, and CT changes.

Results: 37/73 patients manifested ICP greater than 20 cmH2O. 4/14 had an ICP 15-20 cm and 3/4 had ICP less than 15 cm measured at the outofcraniosynostotic resection. Papilledema was seen in 27 patients with an ICP greater than 20 cm and not in the other groups, whereas 5/37 patients with ICP greater than 20 cm were symptomatic and 3/37 had CT evidence for elevated pressure All had normalisation of their ICP after calvarial vault reconfiguration and there was no loss of postoperative mortality/morbidity. The average blood loss was 325 cc and the LOS was 3.8 days.

Conclusions: Delayed repair of scaphocephaly in the older patient may be safely accomplished with minimal morbidity but must keep in mind the distinct possibility of elevated ICP even in the patient with a history of a previous clinical findings. Recognition and treatment of elevated intracranial pressure is paramount in offering a safe and effective craniosynostotic reconstruction in the older patient with scaphocephaly.

51. DEVELOPMENTAL DELAYS IN CHILDREN WITH DEFORMATIONAL PLAGIOCEPHALY: AN UPDATED REPORT Jayesh Panchal, MD, FRCSC; Robin Grunwith; Sharii Patel; Paul French; John Honeycutt (Duluth, Georgia, GA)

Introduction: Over the last few increasing number of studies have demonstrated that children with deformatitional plagiocephaly demonstrate developmental delays. Previous studies have either had small number or did not include consecutive patients creating a selection bias. Purpose: The objective of the study was to determine whether children deformational plagiocephaly (IDP) demonstrate developmental delays and whether psychomotor delays when compared to a typical population.

Methods: This was a prospective study, which involved 12 consecutive subjects with mean ±7 months. Each child was assessed using Bayley scales for motor and psychomotor development at the time of instrument molding helmet therapy. The distribution of the scores was divided into four groups: accelerated, normal, mild delay and significant delay. The distributions of the motor development index (MDI) and psychomotor development index (PDI) were then compared to a "typical" age matched population using chi squared goodness of fit test.

Results: The distribution of the MDI scores was 0 in the accelerated group, 90.6 in the normal group, 84.8 in the mildly delayed group, and 53.6 in the severely delayed group. As compared to 16.5, 68.7, 12.5 and 2.3 respectively. This difference was statistically significant (p<0.001). Similarly the PDI was 20 in the accelerated group, 52.1 in the normal group, 17.4 in the mildly delayed group and 103.4 in the severely delayed group as compared to 14.8, 72.6, 11.1 and 1.6 respectively. Difference was statistically significant (p<0.001).

Conclusion: The present study once again indicates that subjects with deformatational plagiocephaly demonstrate delays in both motor and psychomotor development scales.

52. CORRELATION OF HEAD SHAPE VS. CEPHALIC INDEX FOR MEASURING OUTCOMES FOR CONVENTIONAL CRANIOSYNOSTOSIS

Jayesh Panchal, MD, FRCSC; Mike Dixon; Doug Tepper; Don Parker; Christie Burgin; John Honeycutt; Paul French (Oklahoma City, OK)

Introduction: Although normalization of head shape is the goal of craniosynostosis surgery, there is no consensus whether a cranial index (CI) or perception as measured on a scale is an appropriate tool to measure outcome. CI is a quantitative measurement, but has been criticized because it measures only two dimensions of the skull. The aim of the present study was to determine whether CI and perceptual rating are effective in discerning normal infants from those with sagittal craniosynostosis. CI and perceptual rating of CT scans images were effective in discerning normal infants from those with sagittal craniosynostosis.

Methods: A photographic assessment of 15 pre and postoperative head shapes and CT scans of infants who had undergone cranial vault remodeling for sagittal synostosis and normal age matched controls were performed by five lay observers and five board certified plastic and reconstructive surgeons. The photographs were ranked on a scale of 1 to 10 with 1 representing a "poor" head shape and 10 representing an "outstanding" head shape. The photographs and ACV analysis were performed.

Results: Both perceptual rating and CI were effective in discerning infants who were normal from those with sagittal craniosynostosis (p<0.01). Similarly, perceptual rating of CT scan images CI were also effective in discerning between the normal infants and those with sagittal craniosynostosis (p<0.01).

Conclusion: CI can effectively be substituted instead of perceptual rating of infants in measuring outcome for following surgery for correction sagittal craniosynostosis.

53. THE RISK OF CSF RHINORRHEA IN CRANIOFACIAL SURGERY

Kenneth Stephen Ayken Candidate

Glen Moncrief, MD, Stephen Anthony Wellmore, MD, Tenen Richard M, MD

Introduction: There has been a great deal of variability in reporting the risk of a cerebral spinal fluid (CSF) leak following craniofacial surgery. This is a report on the results of 669 cases.

Methods: Three hundred and seventy-two of these procedures involved the correction of various craniosynostoses. Of the remaining 326 cases were 32 cases of craniofacial surgery using a variety of autogenous bone graft source and, in most cases, away from the cranial base. Three hundred and motor and psychomotor development delays were determined where there was clearly recognized transgression of the cranial base, and, therefore, a significant risk for a postoperative CSF leak: 64 cases of monobloc frontalofacial advancements; 75 corrections of orbital dystopia, hypertelorism, hypotelorism, 80 cranial base tumours and 15 post-traumatic CSF rhinorrhea.

Results: In the non-traumatic, elective, cases (227) there were 5 identified post-operative CSF leaks (2%). Three were stopped with lumbar drainage and two required re-operation (1x). Of the traumatic leaks, five of the thirteen occurred with leakage postop and two stopped with further lumbar drainage and three required a second operation. Of these three, the preoperative CTs did show defects of the cranial base that were missed or undiagnosed and not properly treated.

Conclusions: The authors believe that careful attention is paid to the cranial base at the time of craniofacial surgery (dural defects primarily sutured and reinforced with paracranian or fascia lata and the use of autogenous bone on the cranial base). The risk of a post-operative CSF rhinorrhea can be minimized to the order of 2%.

54. MICROSCOPIC APPROACH TO CRANIOSYNOSTOSIS

James E. Baumgartner, MD, John F. Reichgeld, MD (Houston, TX)

Introduction: Over the last several decades, the treatment of craniosynostosis has evolved from limited strip craniotomies to selective cranial vault reconstruction. Recently Barrow and Aminoglu have reported on minimally invasive, early endoscopic release of craniosynostotic cranial sutures with postoperative helmet molding. The published results have been encouraging. We describe an alternate minimally invasive, endoscopic approach followed by helmet therapy.

Methods: From May 2001 to June 2004, the authors treated 20 patients with the micr-scopic technique. The patients average age a treatment was 12 weeks, with a range from 4 to 18 weeks. There were 13 cases of sagittal, three metopic, two uniconal, one bicoronal and one tricoronal craniosynostosis. All patients underwent preoperative CT scanning of the craniofacial skeleton, intracranial and postoperative anatomic measurements. Surgery was accomplished through small scalp incisions using an operating microscope, and standard neurosurgical instruments. Perioperative transfusions were required in nine cases. Average hospital stay was 1.8 days.

Results: The cephalic index was corrected to normal in 12 of 13 patients with sagittal synostosis. The 13th patient was noncompliant with helmet therapy. In sagittal synostosis patients three months of age or older, the results are superior to those obtained using open cranial vault reconstruction for cranial vault remodeling and correction of craniosynostotic deformities. Results: The microsurgical approach to craniosynostosis is effective as demonstrated by results in our patients. Microsurgical techniques provide an excellent alternative to traditional craniofacial surgery and are associated with decreased postoperative morbidity and hospitalization. This approach is especially useful in neonates and young infants. Results: The microsurgical approach to craniosynostosis is an excellent choice for craniosynostotic deformity in cases of sagittal synostosis. When compared to open microsurgery, hospitalization, operative time and blood loss are reduced.

55. DELAYED MULTISURGICAL CRANIOFACIAL: CLINICAL FEATURES AND SURGICAL CORRECTION

Khaled A. Alj, MD, Ahsaf H. Abolnemer, MD, Ahmed Zakeri, MD, Ahsaf Esselawy, MD (Gaza, Egypt)

Introduction: Delayed multisurgical craniosynostosis is common in our institute representing ~30% of the total volume of cases with craniosynostosis operated upon. This number is higher than reported in the literature and may be due to referral bias. In this work, the clinical features and management guidelines are discussed.

Methods: Eleven patients with delayed craniosynostosis were studied. Most of the craniosynostotic patients were involved +/- the metopic suture. The main reason for referral was the presence of a vault deformity. The overall deformity was subside. Riddging of the evolved sutures was evident. Papilledema was present in all cases, and optic atrophy in three. The IQ was preserved in some patients and was reduced. Diffuse silver button appearance was evident on plain films in all cases. CT showed flattening of the corneal and/or obliteration of the subgaleal spaces.

Results: The surgical correction depends on whether the metopic suture is involved or not. As the deformity is usually mild, the surgery is mainly to expand the skull and remove the hump. Correction of the recession and backslanting of the forehead is a secondary priority.
CONCLUSIONS

Vagus nerve stimulation (VNS) is known to affect some seizures in both human and animal models. However, there are several limitations to these studies, including the lack of consistent findings across different animal models and the potential for variability in VNS parameters.

METHODS

Ten pigs were placed in the latero-position and a laminectomy performed in the lumbar region. Topical penicillin, a known epileptogenic drug, was given to the spinal cord and spinal cord, was most applied to the dorsal surface of the exposed cord. With the exception of two animals which were used as controls, once seizure activity was discernible via convulsion or increased electrical activity, the left vagus nerves were stimulated. Following multiple VNS and with seizure activity confirmed, the cord was transected in the mid-thoracic and VNS again performed.

RESULTS

VNS resulted in cessation of spinal cord seizure activity in all (87.9%) but one experimental animal. Transection of the spinal cord following the site of seizure induction resulted in the ineffectiveness of VNS to cause cessation of seizure activity in all study animals.

K. 6.1. VAGUS NERVE STIMULATION FOR INDUCED SPINAL CORD SEIZURES: INSIGHTS INTO SEIZURE CESSATION

Elizabeth C. Tyler-Kabara, MD, PhD, R. Shane Tubbs, PhD, PA-C, Jeffrey P. Blistrom, MD, John C. Walls, III, MD, W. Jerry Oakes, MD (Birmingham, AL)

Introduction: Vagus nerve stimulation (VNS) is known to affect some seizures in both human and animal models. However, there are several limitations to these studies, including the lack of consistent findings across different animal models and the potential for variability in VNS parameters.

METHODS

Ten pigs were placed in the latero-position and a laminectomy performed in the lumbar region. Topical penicillin, a known epileptogenic drug, was given to the spinal cord and spinal cord, was most applied to the dorsal surface of the exposed cord. With the exception of two animals which were used as controls, once seizure activity was discernible via convulsion or increased electrical activity, the left vagus nerves were stimulated. Following multiple VNS and with seizure activity confirmed, the cord was transected in the mid-thoracic and VNS again performed.

RESULTS

VNS resulted in cessation of spinal cord seizure activity in all (87.9%) but one experimental animal. Transection of the spinal cord following the site of seizure induction resulted in the ineffectiveness of VNS to cause cessation of seizure activity in all study animals.
63. FEASIBILITY OF THE ENDOSCOPIC TRANSPHRENDOGRAPHIC APPROACH TO THE TREATMENT OF PITUITARY TUMORS IN CHILDREN: A PROSPECTIVE STUDY

Kenneth Shulman Award Candidate

Marcus L. Ware, MD; Charles E. Wilson, MD; Sanandip Kumar, MD (San Francisco, CA)

Introduction: Pituitary adenomas are uncommon in childhood and adolescence. Medical treatment of pituitary tumors is effective in some cases. Surgical resection should be considered in patients where vision is threatened or in cases where the effects of the tumor or side-effects of medical therapy are intolerable. The endoscopic transsphenoidal transsphenoidal approach has a safe and effective technique for tumor removal in adults. Here we review our experience with this technique in children.

Methods: We reviewed the charts of 26 children treated surgically for pituitary tumors between 1999 and 2004. There were eight males and 18 females aged 7 to 18 years old (mean of 10 years old). Their operations were performed using the sublabial transsphenoidal approach and using the endonasal approach based on the preference of the surgeon.

Results: Of the 26 patients, 23% had Cushing's disease, 14% had prolactinomas and three (12%) with growth hormone-secreting tumors. Twelve of 18 patients presented with menstrual irregularities. Two patients presented with galactorrhea, three presented with gigantism, and one patient presented with acromegaly. There were 19 gross total resections (GTR) in 27 surgeries. There were 10 GTRs (7%) using the sublabial approach and nine GTRs (64%) using the endonasal approach. GTR was limited by tumor extension beyond the pituitary fossa in two cases where the endonasal transsphenoidal approach was used. There were no complications including good visualization of pituitary fossa in all cases. Conclusions: The endonasal and sublabial approach are both safe and effective in treating children with pituitary tumors.

64. LOW-FRONTAL TRANSVENTRICULAR APPROACH TO THE PINEAL REGION

Jonathan Martin, MD; Hoaluko, MD; James M. Eiland, MD; Robert F. Kastin, MD (Washington, DC)

Introduction: Endoscopic biopsy is an accepted technique of obtaining tissue diagnosis in pineal region pathology. This biopsy via a pre-cornual bur hole may allow the surgeon to simultaneously perform endoscopic third ventriculostomy to treat hydrocephalus. This trajectory can make performance of a biopsy of a mass in the posterior third ventricle difficult. The indirect view provided by angled or flexible endoscopes increases the risk of injury to neurovascular structures in the region of the foramen of Monro, particularly in the hands of inexperienced endoscopists. We present our experience with an alternative trajectory for endoscopic access to this region.

Methods: The endoscope is inserted via a low-frontal trajectory through a supracalvarial incision. Procedures are performed with zero degree rigid endoscopes and biopsy forceps.

Results: We have utilized this approach on four patients. One patient underwent successful fenestration of a pineal cystic lesion for treatment of obstructive hydrocephalus. Tissue diagnosis was obtained on three other occasions in pineal region tumors. No complications occurred. All patients had acceptable cosmetic results. Conclusions: Low-frontal transventricular endoscopy is a biopsy alternative minimally invasive approach to low-frontal third ventricular pathology.

65. ENDOSCOPIC RESECTION OF SOLID INTRACRANIAL TUMORS

Kenneth Shulman Award Candidate

Neal Luther, MD; Mark M. Souweidane, MD (New York, NY)

Introduction: Endoscopic resection of intracranial tumors has been established for cystic tumors such as colloid cysts. Cyst aspiration followed by removal or ablation of the membranous wall is feasible given the constituent features of these tumors. Expectantly, the complete removal of solid brain tumors from the intracranial compartment using the endoscope would create additional technical demands. From a recent cohort of patients undergoing endoscopic tumors, the feasibility of solid tumor removal was reviewed.

Methods: Five patients who presented with solid intraventricular brain tumor were recently offered endoscopic treatment. A solid intraventricular endoscope was used to cannulate the ventricular compartment and identify the tumor morphology. Solids through the working channel, bipolar diathermy, piecemeal sampling, sharp dissection, YAG laser, and catheter aspiration were used in an attempt to remove the lesion. Patient selection, surgical technique, morbidity, and extent of removal are reviewed in the context of this series of patients.

Results: The procedure ranged from 90-180 minutes. Maximal tumor diameter ranged from 1.2-2.5 cm. Four patients had complete tumor removal confirmed by postoperative imaging. No patient experienced significant surgical morbidity. One patient required the placement of an indwelling ventriculostomy catheter for postoperative resection, and one required an additional surgical procedure for tumor resection. Hospital stay ranged from 2-3.5 days, and patient satisfaction and neurocognitive function were normal in all patients. Conclusions: In select patients, endoscopic removal of solid intraventricular brain tumors is possible and safe. The technical nuances of this technique require rigid patient selection, refined instrumentation, and a disciplined surgical technique.

66. THE ROLE OF ENDOSCOPIC MINIMALLY INVASIVE CANONOTOMY FOR THE TREATMENT OF SCAPHOCHELHY

Jan M. Heger, MD; Eric Stelicki, MD; Dew Schafer, MD; Luis Rodriguez, MD (Hollywood, FL)

Introduction: Although indications for surgical correction of sagittal synostosis are quite clear, there are numerous surgical techniques to correct it. Although many surgical techniques exist for the correction of craniosynostosis, most of these procedures require large incisions, and blood loss requiring transfusion remains a significant problem. We report our experience with a technique allowing endoscopic assistance for visualization and specially designed surgical instruments.

Methods: Between June 2000 and June 2006, 35 surgical candidates for cranial synostosis were operated upon. Thirty-six surgical procedures were performed for sagittal synostosis. Of these, three open cranial vault remodeling procedures were performed under a standard incision. The cranial vault was reconstructed using olecranon and screws. In 23 cases, using endoscopic visualization and specially designed instruments, a wide vertex and occipital craniectomy was performed, and barreto-osteotomies were made to widen the biparietal diameter. Molding headgears were applied.

Results: There was no difference in the postoperative cranial index between the two groups. In patients who underwent the traditional cranial vault remodeling, average blood loss was 225 cc; operative time was 3.5 hours, and hospital stay was 4.5 days. In patients who underwent the minimally invasive procedure, average blood loss was 55cc, operating time was 1.5 hours, and hospital stay was 2.5 days. Conclusions: Endoscopic cranial vault remodeling is a safe and acceptable alternative treatment for the treatment of craniosynostosis. It has the potential to provide excellent aesthetic results while decreasing operative blood loss, length of stay, and patient satisfaction.

67. ENDOSCOPIC MANAGEMENT OF SUPRATENTORIAL AND INFRAVENTRICULAR CYSTS

Gianpiero Tamburini, MD; Mauro Calderoni, MD; Luca Massini, MD; Rossana Romani, MD; Gianluca Papi, MD; Lorenzo Malagoni, MD; Paolo Monticelli, MD; Andrea Sanfilippo, MD; Andrea Ceccone DI Rocco, MD (Rome, Italy)

Introduction: Neuroendoscopic fenestration is an actual and effective treatment of choice in patients with intraventricular and paraventricular cysts. However controversies still exist on the need to combine or not ventriculocystostomy with subsequent cysto-isthmocisternostomy so as to how to manage children with associated hydrocephalus.

Methods: From March 2002 to June 2006 we endoscopically treated 3 (3 cases) patients (Miy=-M=1.5, mean age=4-9) years with supratentorial intra or paraventricular cysts.

Results: Patient population consisted of: six children with intraventricular quadrigeminal plate arachnoid cysts; five patients with secondary intraventricular cysts in previously shunted hydrocephalus; three children with parameters of thoracic cavity and secondary intraventricular cysts on a choroidplexus cyst. Cyst manuipulation was the only treatment in nine patients; a test aspiration (three cases) and a shunt revision (three cases) were contemporarily performed in six children. Surgical control of cysts was repre-sented by one case (6.6%) of CSF leakage from the surgical wound. Recurrence of the cyst lesion was observed in both patients (13%) who both underwent a second endoscopic and neuroendoscopic cyst marsupialization.

Complete resolution of preoperative clinical manifestations was obtained in 92.3% of the patients; a partial improvement was maintained in one case. Control MRIs (MRFs) 12-12 months show a significant reduction of the cyst size in 13 cases and a detection of the cyst wall in two patients.

Conclusions: Our experience confirm that endoscopy surgery should be the technique of choice in children with intraventricular and paraventricular cysts. Ventriculocystostomy or shunt revision should be considered only in children with associated hydrocephalus.

68. SHOULD ENDOSCOPIC THIRD VENTRICLE TURNOVER BE THE PRIMARY TREATMENT FOR PEDIATRIC HYDROCEPHALUS IN THE SUDAN?

Hydrocephalus Award Candidate

John Thoma, MD; Jerard Ross (Salt Lake City, UT; Manchester, United Kingdom)

Introduction: Hydrocephalus is an important problem in developing countries of the world. In the Republic of the Sudan it is managed predominantly by pediatric surgeons as there are only three diagnostic and treatment centers in the country located at Khartoum, in the capital city, and 200 beds in Omdurman, the largest town. In total, 33 million. Given the expanding indications for the use of endoscopic third ventriculostomy (ETV) in the developed world and the relatively lesser cost implications we have attempted to introduce ETV into the management paradigm for, primarily, pediatric hydrocephalus in the Sudan.
Methods. As part of a British Council sponsored project aimed at improving the management of children with spinal bifida in the Sudan we were asked to perform endoscopic third ventriculostomies with a Sudanese pediatric surgeon. Results. In two short visits over the last year we have performed 22 ETV for hydrocephalus of various etiologies. The median age was 6 months and the most common diagnosis was that of congenital obstructive hydrocephalus, the next most frequent being hydrocephalus secondary to spina bifida. Ventricles varied in size from moderately enlarged to huge. Eighteen were technical successes with sixteen clinical successes (not requiring subsequent ventriculoperitoneal shunting). Fifteen of the cases were performed by a local existing surgeon with our assistance and guidance. Conclusions. Although this is a small series with necessarily limited follow-up we believe that ETV represents a cost-effective and useful clinical intervention in this population. We discuss the complex issues of hydrocephalus management in the Sudan.

69. HEMORRHAGIC SEQUELAE OF ENDOSCOPIC SURGERY FOR INTRAVENTRICULAR TUMORS IN THE PEDIATRIC PATIENT: ANDERSON, J. Cohen, D.O.; Mark M. Souverain, M.D. (New York, NY) Introduction. The inability to achieve hemostasis is perhaps the most significant limitation of endoscopic surgery for intraventricular brain tumors. However, the true incidence of clinically significant hemorrhage following endoscopic biopsy or resection of brain tumors is poorly understood. Methods. All pediatric procedures in which the authors participated as surgeon or endoscopic tumor biopsy or resection over a 10 year period were reviewed. Significant sequelae resulting from hemorrhage were recorded including: converting the procedure to an open craniotomy, aborting the procedure, treating posthemorrhagic hydrocephalus, or identifying symptoms of intraparenchymal hemorrhage. Results. Thirty-five endoscopic procedures were performed in 35 patients ranging in age from 2 months to 26 years. Thirty-two patients underwent endoscopic tumor biopsy and three underwent tumor resection. Twenty-one simplifying procedures were performed: endoscopic third ventriculostomy (8), ventriculoperitoneal shunting (6), endoscopic septostomy (4), and endoscopic cyst fenestration (3). The size of tumor work was categorized as: lateral ventricle (3), third ventricle (4), and interpeduncular (2). The intraoperative goal (tumor biopsy or resection) was achieved in 34 of 35 procedures. One endoscopic tumor biopsy was converted due to poor visualization from hemorrhage. No patient demonstrated a new postoperative neurological deficit necessitating imaging. Nine patients had an externalized ventricular drain placed at the time of the primary procedure, all of which were successfully weaned. Conclusions. Clinically significant hemorrhage associated with primary endoscopic tumor surgery is a rare event. Based upon the results for this study, concern regarding hemorrhagic sequelae should not serve as a contraindication against endoscopic biopsy or resection of intraventricular brain tumors.

70. CONTINUOUS SPINAL DRAIN FOLLOWING ENDOSCOPIC 3RD VENTRICALOSTOMY: CHANGING THE DEFINITION OF FAILURE SHimon E. C茨niant, M.D.; Pinar Ozisk, M.D.; Jonathan Roth, M.D.; Lina Beni-Adani, M.D. (Tel-Aviv, Israel) Introduction. This study evaluates safety, efficacy, and indications for continuous lumbar drain (CSD) in patients experiencing pressure following endoscopic third ventriculostomy (ETV). Methods and Results. We retrospectively reviewed clinical data of 22 consecutive patients treated between 1996 and 2001 with CSD after ETV decision to insert a CSD was made in selected ETV patients. CSD was inserted in cases of high ICP (12 patients), clinical symptoms indicative of continuing hydrocephalus (two patients), and "pathologically" in eight patients, based either on clinical condition of patients before ETV or technical difficulties during ETV procedure, which seemed to increase the risk of ETV failure. CSD insertion took place either in the operating room immediately following the ETV procedure, or under very specific circumstances. Intracranial pressure was monitored in an ICU setting. Only four patients eventually required shunting, all within one month after ETV treatment. Failure rate of CSD was 8.1% (16/192 patients). Of the 14 patients suffering measured or clinically observed continuing hydrocephalus, 12 were treated. Ultimately, 7 patients were monitored for a permanent shunt. Without the CSD, some of these patients would probably have been declared failed and referred for a standard shunt. CSD provided a window of opportunity after ETV for the absorption system to recover and return to full functionality. Conclusions. Selective usage of CSD is a reasonable and safe method to gain time and facilitate the recovery of absorption capacity following ETV. CSD should be attempted preceding a concomitant ETV patient as a failure.

71. STRATEGY FOR COPING WITH THE NEW NEUROSURGICAL RESIDENCY 80 HOUR WORK WEEK IN A BUSY PEDIATRIC EMERGENCY DEPARTMENT STEPHANIE E. Eisen, D.O.; Michael Multiba, M.D.; Frederick Boop, M.D.; Robert Sanford, M.D. (Memphis, TN) Introduction. The new neurosurgical residency work week created in July 2003 created staffing shortages in our training program and forced changes in neurosurgical resident coverage in our busy pediatric emergency department. Methods. A set of guidelines were developed by the authors regarding management of shunt patients and neurosurgical trauma patients in the emergency department prior to July 1, 2003. These were given to the emergency department medical staff and have been utilized over the past year since July 1, 2003. Results. The guidelines and our experience with them will be discussed. We have successfully reduced the number of "fixatives" that consults the neurosurgical house staff have been asked to see in the pediatric emergency department. There were three failures with the system. Two shunt patients were seen at home who were found to have partial shunt malfunctions in follow up and had surgery one week later, and one trauma patient would have been managed differently if it had been seen by the resident. Interestingly, with these modifications in the workflow and workflow reduction, the overall success rate was 81.1% (16/20 patients). Of the 14 patients suffering measured or clinically observed continuing hydrocephalus, 12 were treated. Ultimately, 7 patients were monitored for a permanent shunt. Without the CSD, some of these patients would probably have been declared failed and referred for a standard shunt. CSD provided a window of opportunity after ETV for the absorption system to recover and return to full functionality. Conclusions. A strategy can be developed and safely utilized to reduce the number of resident emergency consults requested of the neurosurgical house staff in order to comply with the new 80 hour work week rules.

72. THE ADULT PRACTICE OF PEDIATRIC NEUROSURGICAL, CLINICAL, REFERRAL, AND FINANCIAL ISSUES David Finn, M.D., PhD; Rita-Maria Douglas, MBA (Chicago, IL) Introduction. Though pediatric neurosurgery is traditionally restricted to patients under 18 years, "pediatric" neurosurgical procedures performed in adult patients have been deemed acceptable for ABS/NSF re-certification. To investigate the nature of "adult" pediatric neurosurgeons, we examined the clinical, referral, and financial aspects of such a mixed practice. Methods. Procedural codes, diagnosis, age, billed and collected, charges, insurance carrier, and referral sources were retrospectively examined from our institutional pediatric neurosurgical databases for fiscal years 2002 and 2003. Results. 1,131 procedure codes were submitted: 840 (74%) in children (18y). Distribution of diagnoses was similar in both age groups for "pediatric" diagnoses (e.g., Hydrocephalus, 29% and 31%, respectively; Spina Bifida 4% and 6%) but different where adult neurosurgeons had developed recognized expertise (e.g., Epilepsy, 3% and 10%; trauma, 0% and 6%); Children were more commonly referred by pediatricians; adults by self-referral or adult neurosur- geons. Financially, the collection rate for adults (70%) was significantly greater (p<0.001) than for children (32%). Conclusions. In our database, the adult practice of pediatric neurosurgery consists of pediatric problems for which there is no recognized adult neurosurgical sub-specialty. Referral patterns suggest a lack of training or availability of adult neurosurgeons to manage these problems. Interchange between adult neurosurgeons with adults for these problems is significantly greater than that for pediatric patients. These observations show a need and potential incentive for an adult pediatric neurosurgery and may argue for including selected adult case material in pediatric neurosurgical training.

73. IMPACT OF A NURSE PRACTITIONER ON A PEDIATRIC NEUROSURGICAL SERVICE Judith Holman, MSN, RN; David Finn, MD, PhD (Chicago, IL) Introduction. The introduction of the 80 hour work week regulations has challenged resident training programs to creative scheduling while maintaining comprehensive training experiences. The restrictions may be adaptable to medical services, but have been more challenging to an academic surgical program. The particular challenges include optimizing academic learning opportunities, operating experiences, and patient care, while adhering to the regulations. This paper examines adding a nurse practitioner to a pediatric neurosurgical program, in response to the resident work rest restriction. Methods. A 1-10 rating scale was developed, distributed to 23 physicians, nurses and social services. Participants were asked to retrospectively rate their satisfaction with the service available, responsibilities and clinical satisfaction before the new NP addition, and after one year. The hospital paging log was also reviewed and compared with times and days when the NP was not available. Finally, the record of sentinel events before and after were reviewed. Results. The results demonstrated significant increase in satisfaction scores (p<0.05). In particular, overall satisfaction improved from mean of 4.2 to 9. The number of paging calls received by the NP was increased compared to the residents. The sentinel events decreased(from 2 to 0) despite increased complexity and increased volume of surgical cases performed.

Conclusions: The addition of an NP to a pediatric neurosurgical service has had a positive impact on patients' safety and staff satisfaction. Presumably this will allow concurrent improvement in the resident's ability to devote adequate time to academic and training experiences.

74. VIRTUAL REALITY AS A TRAINING TOOL FOR ENDOSCOPIC NEUROSURGICAL PROCEDURES Hydrocephalus Award Candidate SUNI MAYOLA, MD; Cenk Cokiroglu, PhD; Nathan Brown, Alan R. Cohen, MD (Cleveland, OH) Introduction. Despite the widespread popularity of minimally invasive endoscopic neurosurgery, there is currently no agreed upon standardized method for training in this field. We have developed a computer-generated virtual reality tool to simulate performance of an endoscopic procedure. Conclusions: The multidisciplinary collaboration among neurosurgeons, computer scientists, and the public at our institution, we have created a virtual reality simulation combining magnetic resonance imaging data with a haptic interface workstation. Results: A reliable and extremely precise prototype simulator was developed. Magnetic resonance imaging data was first converted into geometric polygons and rendered on a computer screen, replicating the visual, mechanical and behavioral aspects of brain tissue. The haptic hand controllers and virtual display of the operative site allowed trainees to manipulate endoscopic surgical instruments in a virtual environment with tactile feedback. We have used the system to simulate endoscopic third ventriculostomy and endoscopic procedures for neoplasms and cysts.

Conclusions. Virtual magnetic resonance environment can be considered an integral part of comprehensive training and an effective and safe tool for neurosurgical training.

AANS/CNS SECTION ON PEDIATRIC NEUROSURGICAL SURGERY

DECEMBER 8 - SAN FRANCISCO

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75. USE OF RAPID MRI TECHNIQUES IN UNSEENED CHILDREN

Hydrocephalus Award Candidate
Patricia B. Quebede, MD, Alex Mamourian, MBA, Ryszard Hoyet, Ann-Christine Duhaime, MD (Lubanen, NH)

Introduction: In January 2003, we began to use rapid MRI techniques in selected hydrocephalic children. Because of the favorable results, we have expanded this technique for a number of additional indications. We report our initial experience with these techniques.

Methods: Between January 2003 and May 2004, we performed 103 rapid MRI studies in unseated children (age range, 3 months to 14 years). Specific techniques included fast-scan T2-weighted imaging (scan time is approximately 30 seconds). More recently, we have also included “Moving Target” MRI protocols.

Results: 103 scans were performed. No child failed scanning and required sedation. The most common indication for the scan was evaluation of ventricular size for shunted hydrocephalus with screening for macrocephaly as the second most common indication. Unexpected findings included Chiari malformations, extra-axial collections, and syringomyelia. These techniques were reliably able to identify benign enlargement of the subarachnoid spaces. Parent satisfaction was extremely high and the cost was equivalent to CT scans. This technique, radiation exposure is avoided.

Conclusions: Rapid MRI scanning offers a number of potential advantages over CT scanning for specific indications. Newer “Moving Target” techniques allow for improved resolution. We are currently investigating experimental protocols to expand these indications to CT scans. With this technique, radiation exposure is avoided.

76. HEPARIN BINDING EPIDERMAL GROWTH FACTOR (HB-EGF) OVEREXPRESSION IS IMPlicated IN THE DEVELOPMENT OF HYDROCEPHALUS IN TRANSGENIC MICE

Hydrocephalus Award Candidate
Bart A. MacDonald, MD, Gerhard Reab, PhD, Katsuhiko Gotoh, MD, PhD, Sun Ying Pang, PhD, Eshio Naka, PhD, Nina Irwin, MD, Philip Klages-Bifer, PhD, Joseph F. Madan, MD (Boston, MA)

Introduction: Transgenic models of hydrocephalus offer insights into mechanisms which may be targeted therapeutically. We report a new “knock in” expression of hydrocephalus resulting from the heparin binding EGF gene, and demonstrate an epigenetic influence of sex hormones.

Methods: Transgenic mice constitutively over-expressing HB-EGF were created by a plasmid insertion technique. Unexpectedly, many of the mice developed hydrocephalus observed by cranial doming, which was often fatal. The presence of the human HB-EGF transgene was determined by PCR analysis of tail sections. Quantitative MRI was used to determine volumes of CSF spaces within the cranium.

Results: Hydrocephalus is clinically evident by head doming and failure to thrive in 4% of the offspring of this HB-EGF expressing transgenic MRI. Imaging of 51 animals with apparently normal heads and behavior from seven litters revealed that 33% had hydrocephalus defined by volume measurement greater than 40 mm3. MRI and preliminary histology suggest communicating hydrocephalus. All animals that developed hydrocephalus had the transgene by PCR and no animals without the transgene developed hydrocephalus. Female animals had nearly double the incidence of ventriculomegaly (0.25 x 51/52, 48% vs. 19.2%; chi square = 4.75; p<0.01, Mann-Whitney U test).

Conclusions: The HB-EGF transgene induces hydrocephalus by an unknown mechanism, potentially mediated by estrogens or other hormones (for which there is precedent in other tissues). A role in humans could suggest a pharmacological adjunct in the treatment of this problem.

77. CHARACTERIZATION OF MURINE CD313+ CEREBELLAR STEM CELLS AND MURINE MEDULLOBLASTOMA STEM CELLS

Hydrocephalus Award Candidate
Sharon Chiappa, PhD, Corey Raffel, MD, PhD (Rochester, MN)

Introduction: Medulloblastoma differentiates along neural and glial lines. Stem cells may be responsible for the growth of this tumor. We hypothesize that genetic events leading to the unregulated growth of medulloblastoma can be identified and studied by comparing the properties of normal cerebellar stem cells to medulloblastoma stem cells. We used a murine model of medulloblastoma to address molecular alterations occurring in this tumor.

Methods: CD313+ neural stem cells have been isolated from murine cerebellum. Neurospheres developed from CD313+ cells from embryonic samples, and from postnatal days 10, less neurospheres were seen and no neurospheres developed from postnatal day 20 cells. CD313+ and CD133+ cells from a tumor occurring in a Pcl-v mouse have also been isolated. The postnatal cells grow as “tumor spheres.” The neurospheres from normal cerebellum were placed into culture conditions favoring differentiation. The neurospheres differentiated into 5-10% astrocytes, 60-70% neurons; and 10-20% oligodendrocytes. When CD133+ tumor spheres were placed into similar conditions, up to 90% of cells underwent neuronal differentiation. The gene expression profile of normal murine external granule cell layer cells and CD313+ Pcl-v tumor stem cells have been compared using the Affymetrix high density mouse genome 430 2.0 array. Interestingly, expression of Enil, a gene required for cerebellar development, and P0 are markedly downregulated in the tumor.

Conclusions: Insights into medulloblastoma can be gained by comparison of normal to tumor stem cells.

78. THE Efficacy OF Duragen AS A Dural SUBSTITUTE FOLLOWING CHIARI Decompression

Kenneth Shulman Award Candidate
Shabbir F. Dinh, MD, Amor Sivakami, MD, Majed Hanna, MD, Michael F. Stefel, MD, Philip Sturm, MD, Leslie Sutton, MD (Philadelphia, PA)

Introduction: Suboccipital decompression is routinely used for the treatment of Chiari malformations. The efficacy of this procedure has been traditionally believed to require a water tight seal with primary closure of the dura with either pericranium or allograft. We evaluated the use of a synthetic dural substitute, Duragen, (Integra Neurosciences, Plainsboro, NJ) that does not require sutures as the dural patch following suboccipital craniectomy (SOC) in this patient population.

Methods: Twenty-eight patients including 23 diagnosed with Chiari I malformations and five with Chiari II who underwent SOC and C1 laminectomy were retrospectively evaluated. During the procedure, the dura was opened widely with visualization of the 4th ventricle. In all but four patients, the rhachidian was opened as well. Duraplasty was performed by applying Duragen over the dural defect. All patients were assessed for the presence of a pseudomeningocele, wound infection, CSF leak, and the need for re-operation either for wound revision or the placement of a ventriculoperitoneal shunt.

Results: All patients tolerated SOC without operative complications. Lumbar drains were not placed. The mean age of patients at diagnosis was nine years (median = 11). The mean length of follow up was 17.5 months (range = 5-79). Ten of the Chiari I patients, seven had evidence of a syrinx at the time of operation. There were two pseudomeningoceles, no wound infections, no CSF leaks, and as a result no re-operation was required in any patient.

Conclusions: The dural substitute, Duragen, provides an effective dural barrier following SOC and permits a rapid dural repair with very low postoperative morbidity.

79. PROPER SELECTION CRITERIA FOR SURGICAL MANAGEMENT OF BIRTH RELATED BRAHIC PLEXUS PALSY

Kenneth Shulman Award Candidate
Kaye K. Thomas, MD, Richard D. Goldner, MD, Timothy M. George, MD (Durham, NC)

Introduction: Selection criteria for surgical intervention of obstetrical brachial plexus palsy (OBPP) continue to be controversial. We analyze our criteria for surgery and specifically relate it to outcome.

Methods: We retrospectively analyzed 30 consecutive patients with OBPP who were referred after failure of conservative management. Each patient was evaluated for age, neurological status, cephalometry, electromyographical studies (pre and intra-op), and surgical technique.

Results: Eleven patients were selected for surgical intervention based on age greater than or equal to 6 months, poor upper extremity function using the Toronto Muscle Grading system (TMG) and EMG demonstrating brachial plexopathy. Surgery included neurolysis (n=15) and direct neurotization using pectoral nerves (n=1) after no improvement on intra-op EMG following neurolysis. Postoperatively 54% had significant improvement (greater than or equal to three point increase on TMG), 27% had moderate improvement (greater than or equal to two point increase on TMG). Only one patient had minimal improvement (greater than or equal to one point increase on TMG). One patient who underwent neurolysis of the upper trunk had improvement of dexterity and biceps but worse function of hand intrinsic due to contractures resulting in an eight point decrease on TMG.

Conclusions: Surgical treatment of OBPP achieved good results with proper patient selection, preoperative evaluation, timing of surgery, intraoperative evaluation and surgical procedure performed.
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Andrew Jea, MD (Miami, FL); R. Michael Scott, MD (Boston, MA)

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105. Chiari 1 Malformation in Association with FG Syndrome

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104. Surgical Therapy for Refractory Extratemporal Nonlesional Focal Epilepsy in Children

Shanandooh Robertson, MD; Monisha Goyal, MD (Cleveland, OH)

107. Correction of Sagittal Craniosynostosis Using a Bilateral "Trap-Door" Surgical Technique: A Ten Year Review

Kenneth Shulman Award Candidate

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106. Corpus Callosootomy Following Implantation of a Vagal Nerve Stimulator for Control of Intractable Epilepsy

P. Daniel McNeill, MD, FRCS(C) (Halifax, NS, Canada); Jean-Pierre Farman, MD, FRCS(C); Jose L. Montes, MD, FACS; Bernard Rosenblatt, MD (Montreal, PQ, Canada)

108. Treatment of Pediatric Clival Chordomas

Bryan C. Oh, MD; Mark D. Krueger, MD; J. Gordon McCord, MD

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however, DTI for descending motor pathways could be successfully determined. We are currently attempting to define the appropriate threshold for mapping motor cortex with MRI and defining an optimal region of interest to determine corticospinal tracts accurately by DTI.

Conclusions: DTI combined with MRI can be used to track subcortical motor and somatosensory fibers in older pediatric patients with AVMs. This method has the potential to reduce treatment morbidity by revealing the subcortical pathways of eloquent cortex. The merging of functional brain imaging with white matter tractography will be important for future studies of both the normal and pathologic brain, and as an adjunct for treatment planning.

102. Outcome following surgical revascularization in patients with moyamoya syndrome and down syndrome

Andrew Jea, MD (Miami, FL); R. Michael Scott, MD (Boston, MA)

Introduction: We wished to describe the clinical features of moyamoya syndrome in children and adults with Down syndrome, and to determine the results of surgical revascularization in this patient population at late follow-up.

Methods: We reviewed the records of patients with moyamoya syndrome associated with Down syndrome in a consecutive series of 181 patients who underwent primary revascularization surgery for cerebral ischemia from January 1, 1985 to December 31, 2003.

Results: Sixteen patients, six males and 10 females, with moyamoya syndrome and Down syndrome were operated on during this period. Average age of onset was 9.3 years (range 1 - 29), average age at surgery was 9.8 years (range 2 - 29). As anticipated in this patient population, many of the patients had a history of congenital heart disease, and several had interesting histories of frequent head and neck or respiratory infections. Most patients presented with TIA or stroke confirmed by preoperative CT and MRI. Pre-operative angiography demonstrated presence of bilateral disease in all patients. All patients underwent a standard surgical treatment --
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Conclusions. We conclude advanced neuromyographic techniques and an aggressive surgical approach can identify patients who were previously not considered good surgical candidates. Although not without risks, this strategy provides children with noninvasive extra-temporal intractable epilepsy an opportunity for a much improved quality of life.

105. CHAIR 1 MALFORMATION IN ASSOCIATION WITH FG SYNDROME Chen N. Gottfried, MD, John M. Opitz, MD, Marion L. Walker, MD, Salt Lake City, UT

106. CORPUS CALLOSOYSIS FOLLOWING IMPLANTATION OF A VAGAL NEURO STIMULATOR FOR CONTROL OF INTRACTABLE SEIZURES P. Daniel McNealy, MD, FRSCS (Halifax, NS, Canada); Jean-Pierre Farmer, MD FRCS; Jose L. Montes, MD, FACS; Bernard Rosenblatt, MD (Montreal, PQ, Canada)

Introduction: Corpus callosum and vagal nerve stimulation are treatment options available to patients with non-lesional, generalized epilepsy that is refractory to medical therapy. Patients who have previously undergone corpus callosumotomy have been implanted with vagal nerve stimulators with some success. To our knowledge, we describe a unique association between Chair 1 malformation and FG syndrome and attempt to determine the optimal treatment of these patients.

Methods: We performed a retrospective chart and radiology review of 144 pediatric FG syndrome patients for evidence of tonal cerebral cortex or brain MRI.

Results: Eleven of these 144 patients (7.6%) had tonal cerebral cortex and in eight patients (5.6%) the tonal lesions were located at greater than 5 mm below the foramen magnum. Four of these patients underwent posterior fossa decompressions and surgery was performed at a mean age of 3 years.

Conclusions: A significant improvement in seizure control was seen in 68% of the patients resected. The two patients with non-invasive monitoring had a mean seizure frequency of 74%.

Conclusions: We conclude advanced neuromyographic techniques and an aggressive surgical approach can identify patients who were previously not considered good surgical candidates. Although not without risks, this strategy provides children with noninvasive extra-temporal intractable epilepsy an opportunity for a much improved quality of life.

107. CORRECTION OF SAGITTAL CRANIOSYNOSTOSIS USING A BILATERAL ‘TRAP-DOOR’ SURGICAL TECHNIQUE: A TEN YEAR REVIEW

Kenneth Shulman Award Candidate

Christan W. Sikorski, MD, Lawrence Field, MD, Balkrish Yamin, MD, Daniel J. Curry, MD, David E. Kuhn, PhD, David M. Fim, MD (Chicago, IL)

Introduction: Multiple methods have been described for the correction of sagittal synostosis. The literature insufficiently document the morbidity and recurrence rate associated with most of these techniques. We describe a modified surgical technique that includes: complete resection of the closed suture, reshaping of cut bones and creation of a bilateral “trap-door” mechanism that allows for unimpeded transverse brain growth. The results of 22 consecutive patients who underwent this procedure at our institution are presented.

Methods: We reviewed 22 consecutive cases of sagittal craniosynostosis corrected with this technique. Most patients underwent surgery prior to 1 year of age. The mean age at surgery was 6 months. Clinical examination and computed tomography scans were performed to compare preoperative and postoperative cranial indices.

Results: All patients had postoperative normalization of their cranial index. There were no deaths and no postoperative cranial defects or device removal. No postoperative helmets were used for cranial shaping and average hospitalization was three days.

Conclusions: Correction of sagittal craniosynostosis using this technique is safe and reliable. The construction of a “trap-door” mechanism significantly reduces the need for re-operation. The long-term results of these patients are being evaluated.

111. AICARDI SYNDROME ASSOCIATED WITH ENCEPHALOCELE IN TWO PATIENTS

Kenneth Shulman Award Candidate

Rebekah C. Austin, MD, R. Gray Weaver, Jr., Steven D. Glazer (Winston-Salem, NC)

Introduction: Aicardi syndrome is a rare X-linked congenital disorder found in infants with involuntory flexor spasm, corpus callosum agenesis, and chorioneal leucar lesions. Recent case reports have extended these findings to include episodic cyanals, choral pleuras, papillomas, optic disc colobomas, and various migrational abnormalities as well as cleft lip and palate and vertebral anomalies. These additional clinical diagnoses are important to recognize to fulfill the full spectrum of Aicardi syndrome and provide more insight into the embryologic events which have yet to be fully understood.

Methods: Two female neonatal patients were referred for consideration of encephalocele repair. Both pregnancies were unremarkable and the encephaloceles were detected by birth. One infant had a midline frontal ossa lesion whereas the other demonstrated a midline parieto-occipital lesion. Each patient had preoperative MRI demonstrating callosal agenesis and vermian hypoplasia. Both patients had ophthalmologic confirmation of typical retinal lesions of Aicardi syndrome. One patient had bilateral optic n-awaited encephalocele repair. The patients have been followed for 5 years. Both patients suffer from intractable seizures and cognitive development has been minimal.

Conclusions: We present the novel association of encephalocele in two patients meeting clinical criteria for Aicardi syndrome. Small localized encephaloceles do not generally portend a poor neurologic outcome, however those associated with other congenital malformations may warrant more cautious caregiver counseling. Brain MRIs and photographs of chorioneal lacerance illustrate the characteristic findings in the presented cases.
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110. TOXICITY AND EFFICACY STUDY OF LOCALIZED DELIVERED CHEMOTHERAPY IN A NOVEL RAT MODEL OF INTRACRANIAL SPINAL CORD TUMORS

Kenneth Shulman Award Candidate
Gavito Padilla, MD; Gavrou-Mavroukou, BS; Federico G. Legnani, MD; Betty M. Tyler, MD; Neha Gosalia, BA; Jonathan Finkin, BS; Asia Hide, BA; Carlos A. Bagley, MD; Henry Brem, MD; George Jaffe, MD (Baltimore, MD)

Introduction: Intramedullary spinal cord tumors (IMSCs) are associated with significant morbidity/mortality and current treatment strategies for IMSCs remain limited. Systemic chemotherapy has been unsuccessful for these tumors. Recent advances in local drug delivery systems may point the way for IMSCs. We report the toxicity of novel injectable injectable chemotherapy-delivery systems: Oncogel®(2ug/gel), SABER®(Calciobaltin gel), and PlasmidK®(microspheres) in rat spinal cord, and the efficacy of Oncogel®-1.5% in an IMSC model using 9L-gliosarcoma in rats.

Methods: Toxicity. Fischer-344 rats (n=21) were randomized into seven groups (3 rats/group) to receive an intramedullary injection (IMI) of either ReGel (emtopy gel). Oncogel®-1.5%, Oncogel®-6%, Savel®-15%, PlasmidK-2mg/kg, PlasmidK-20mg/kg, or DNEM (Dubois-Croce's modified-eagle medium). Daily evaluation of hind limb motor function using the BBB (Basso-Beattie-Bresnahan scale) and weight gain were analyzed. Fischer-344 rats (n=12) were randomized into 3 groups (4 rats/group): group one received a IMI of 9L, plus Oncogel®-1.5% or ReGel, respectively; animals were assessed using the BBB scale.

Results: Toxicity: Animals treated with Oncogel®-6% showed acute toxicity (one animal died on day four, three animals were euthanized due to complete paralysis on day five). Animals in other groups showed weight gain and maximal BBB scores throughout the experiment. Efficacy: group one (controls) had median onset of paralysis (MOP) of 10 days, group two (Oncogel®-1.5%) had no significant motor deficit by day 10. Group three (ReGel) had MOP 14±4 days.

Conclusions: Local delivery chemotherapy, with the exception of Oncogel®, was well tolerated by animals. These findings are consistent with previous work. Further studies are needed to determine the efficacy of SABER® and Plasmider for IMSCs.

112. ENDOSCOPIC MANAGEMENT OF THIRD VENTRICULAR ARACHNOID CYSTS

Theodore Spinak, MD; Tian Nguyen, MD; Mark Strother, MD; Gordon McComb, MD (Los Angeles, CA)

Introduction: Arachnoid cysts within the third ventricle are rare and can manifest as mental status changes and hydrocephalus if there is obstruction of cerebrospinal fluid (CSF) flow. In this report, the authors evaluate the efficacy of neuroendoscopy in the treatment of children with symptomatic third ventricular arachnoid cysts.

Methods: A retrospective analysis of children with arachnoid cysts located within the third ventricle treated by endoscopic cystoventriculostomy between 1999 and 2002.

Results: Six children, four of them boys, were included. The median age at the time of surgery was 4 years. Signs and symptoms included headache, progressive increase in the size of cyst and/or lateral ventricles, and mental status changes. Two children had ventriculoperitoneal shunts inserted 10 and 23 months prior but had recurrence of symptoms of hydrocephalus. Their shunts were removed during the endoscopic surgery. Even though three ventriculostomy was attempted in two children after fenestration of the cyst, in only one was it completed. Median follow-up time was 39 months (2-143 months). All patients had improvement of symptoms and significant reduction in cyst volume and at least marginal decrease in the size of the lateral ventricles on follow-up imaging. One of the two children who also had third ventriculostomy had CSF leak after the operation and developed meningitis. After a course of antibiotics, a ventriculoperitoneal shunt was placed.

Conclusions: Endoscopic fenestration and third ventriculostomy is an effective primary treatment of third ventricular arachnoid cysts. Satisfactory long-term decrease of the cyst and restoration of normal CSF circulation can be obtained.

113. SIMULTANEOUS ENDOSCOPIC THIRD VENTRICULOSTOMY (ETV) AND BIOPSY OF INTRAVENTRICULAR BRAIN TUMORS: A SIMPLIFIED APPROACH

Kyle T. Chapelle, MD; Mark M. Suvorov, MD, FACS (New York, NY)

Introduction: Endoscopic management of patients with hydrocephalus and a posterior third ventricular or pineal region tumor is well established. However, given the multiple goals of surgery, each optimized by a different trajectory, alternative methods have advocated the use of flexible endoscopes or multiple entry sites. A technique using a single entry site with a rigid endoscope is reviewed.

Methods: Patients undergoing endoscopic management of hydrocephalus and a posterior third ventricular tumor were reviewed. Fourteen patients with ages ranging from 2 to 59 years (mean 23.9 years) were included. Conventional landmarks were used to access the ventricular compartment through a single, right-rectangular burr hole. Stereotaxis was used as a navigational adjunct in four patients. A 40 degree lens was primarily used for the ETV and a 300 angled lens directed posteriorly was used for the tumoral pathologic aspect. After the intended goal, and patient outcome are reviewed.

Results: Successful ETV and diagnostic biopsy were accomplished in all patients. ETV-resistant ergo biopsy in all cases. Three patients had an externalized drain placed at the time of the procedure for pressure monitoring. No patient had recognized intracranial hemorrhage. One subject suffered a diaphragm meniscus and required a ventriculoperitoneal shunt due to continued elevated pressures.

Conclusions: Use of an interchangeable, solid less endoscope through a single burr hole is safe and effective for simultaneous ventriculostomy and tumor biopsy. This simplified method avoids the inferior resolution of storable, fibrinoclastic endoscopes and the purported need for multiple burr holes.

114. A RESEARCH-ORIENTED DATABASE FOR PATIENTS WITH HYDROCEPHALUS

Emily J. Draper, MS; Yendi Zhou, MS; James P. McKee, MD; IL (Dartmouth, MI) Martin U. Schulman, MD, PhD (Leipzig, Germany); Sandeep Sood, MD; Steven D. Harms, MD (Dartmouth, MI)

Introduction: To overcome the limitations of current patient databases as a research tool, especially for hydrocephalus studies, we have developed a comprehensive program and tested it at the Children's Hospital of Michigan.

Methods: The database was built using Oracle Database and Oracle Developer software for a Windows platform.

Results: Patient information is compiled from the hospital's electronic systems (text and images) office charts, and hospital medical records, and organized onto the patient's main page, including demographical information, admission dates, and the main and admitting diagnoses. Based on a particular admission date, a single click can locate admission details such as operative reports, radiology reports and images, laboratory results, and complications. The most important aspect of this database is its capability to run detailed searches. One may perform a search with criteria such as "male" and "obstructive hydrocephalus," then narrow the results by obtaining parameters such as "PS Medical valve" and "blood culture negative, lymphocytic epidemics." Search results can be graphed in Oracle and/or exported to Microsoft Excel for further analysis.

Conclusions: MR imaging is an effective tool for demonstrating lesions of the brachial plexus worthy of surgical exploration.

115. MRI FINDINGS IN EBR'S PALSY

Hydrocephalus Award Candidate
Juan C. Alatrec, MD; Daniel Leffert; Rick Abbott, MD (New York, NY)

Introduction: We reviewed MR imaging in infants with Ebr's palsy. The goal was to determine the effectiveness of MRI imaging in predicting operative findings for these infants.

Methods: Fifteen patients (mean age: 14.5 months) underwent brachial plexus exposure. The T1 and T2-weighted pre- and post-operative MR images were analyzed and correlated to surgical findings as outlined in the children's operative notes.

Results: Through imaging, the presence of at least one pseudoneuromeningeal was found in eight of the 15 patients (53.3%) while three of the 15 patients (20%) had multiple pseudoneuromeningeal. Shoulder subluxation was seen in 11 patients (73.3%). Fourteen children (93.3%) had imaging abnormalities consistent with either a reparative neurapraxia or scar tissue investing plexus elements. We found differentiating between the two with MR imaging to be nearly impossible. At surgery, scar tissue was found entrapping the nerve's proximal trunk and/or lateral and posterior cords in eleven patients (73.3%) while four patients had reparative neurapraxia. Two patients had both entrapment by scar tissue and a reparative neurapraxia. Either entrapment by scar tissue or neurapraxia was found in all 15 patients (100%).

Conclusions: MR imaging is an effective tool for demonstrating lesions of the brachial plexus worthy of surgical exploration.
117. PATTERNS OF RECURRENT IN SURGICALLY RESECTED INTRACRANIAL EPIDERMIDIS IN CHILDREN
Chris Haxell, MD; Mark D. Krizgal, MD; Ira Brown, BS; J. Gordon McDonald, MD (Los Angeles, CA)
Introduction: Infratentorial ependymomas are among the most challenging pediatric brain tumors to effectively and safely treat. Although complete surgical resection is the goal, the proximity of these tumors to vital brainstem structures often precludes such an undertaking. Even with gross total resection, with or without adjuvant therapy, recurrence occurs.
Methods: We retrospectively reviewed 30 children who underwent surgical resection for infratentorial ependymomas at our institution from 1988 to 2003. Time to recurrence, if any, was calculated and correlated to extent of resection and tumor histology.
Results: There was tumor recurrence following surgical resection in 10 of 30 (33%) patients, eight (80%) of whom had a gross total resection by peroperative MRI. Average time to recurrence was longer in patients who had gross total resection versus subtotal resection (26 months vs. 8 months p=0.01). There was no difference between patients with anaplastic vs. pilocytic histology (median 12 months vs. 29 months p=0.35). 90% of recurrences occurred by 42 months after surgery with the latest recurrence at 48 months. In all but one patient the time to recurrence obeyed Collins' Law. In seven of ten cases the recurrence was discovered by surveillance MRI while three patients developed new signs or symptoms prompting imaging.
Conclusions: Tumor recurrence is common even after gross total resection. Time to recurrence is significantly shorter with subtotal resection, but is not affected by tumor histology. Time to recurrence follows Collins' Law in most instances. Serial imaging is a necessary and important part of postoperative care following resection of an ependymoma.
118. IMPLICATIONS OF THE ANTENATAL DIAGNOSIS OF VERTEBRAL BODY ANOMALIES IN PATIENTS WITHOUT SYNOVIAL HAMARTOMAS
John Thorne, MD; Jerad Ross; Cary Bannister; Sarah Russell; Ann Borell; Manchester (United Kingdom)
Introduction: Vertebral body anomalies are detectable in the fetus by ultrasonography at 18-20 weeks gestation. The anomalies encountered are a heterogeneous group, and an understanding of the different prognoses is important, so that both clinicians and parents are prepared for the potential problems.
Methods: Data was collected from records kept of the foetal anomalies found on routine scanning. The proforma identifies the anatomical site of all anomalies. From this data it was possible to elicit which were the patients with spinal anomalies. The scan reports were then obtained and examined for data with vertebral body anomalies were included in the report. Those with meningocoele, myelomeningocele, spinal dysraphism, diastematomyelia, cording and limb body wall complex were all excluded. The ultrasound scans, medical records and follow up data were recorded.
Results: Eighty-eight cases were found. Twenty-five had isolated vertebral anomalies and the rest complicated. Of the 25 with isolated anomalies, 20 delivered normally, one died in utero, one pregnancy was terminated and outcome data was not available for three. Of the 63 with complicated anomalies, 25 delivered normally of whom seven died in the neonatal period, 33 presented with cutaneous changes, and 19 patients underwent revision due to malformation. Three additional patients had their shunt system removed after successful endoscopic decompression. The most common programmable valve itself malfunctioned in seven of the 19 patients undergoing revisions, as documented by failure to open at an expected pressure by manometer testing. Of the remaining 12 patients, two developed signs and symptoms of increased intracranial pressure, complications related to subcutaneous placement of the bone. One patient developed a wound infection two weeks s/p cranioplasty.
Conclusions: Decompressive hemiepicondylectomy is a useful procedure to manage mass effect from a variety of non-traumatic mass lesions in the pediatric population. Patients can survive and improve to be functionally independent. Storage of the bone in a subcutaneous abdominal pocket is safe and well tolerated. Decompressive hemiepicondylectomy should be considered for non-traumatic mass lesions in the pediatric population.
119. ARE PROGRAMMABLE SHUNT VALVES AS RELIABLE AS NON-PROGRAMMABLE OUR EXPERIENCE WITH THE FIRST NINETY-TWO VALVES IMPLANTED
Francisco T. Mangan, DO; Jose A. Manansan, MD; Prithvi Narayan, MD; Judy R. Mishima, MD; T. S. Park, MD; Matthew D. Smyth, MD (St Louis, MO)
Introduction: The use of adjustable differential pressure valves with a spinal-protective device (Sinstra Valve, Medtronics) has improved shunt performance when properly indicated. Its efficacy has been documented previously; however, there is no data available regarding its reliability in clinical use.
Methods: A retrospective analysis of the charts of 92 programmable valves implanted in our institution from April 2002 to June 2004 was performed. Regular follow-up occurred on all patients ranging from one to 26 months, with a mean and median follow-up time of 9.75, and nine months respectively.
Results: Patients ranged from two weeks to 16 years of age. Eighty-one patients had 92 programmable valves implanted. Fifty-nine patients had no complications from these devices, 26 from infection, and 19 patients underwent revision due to malfunction. Three additional patients had the shunt system removed after successful endoscopic decompression. The most common programmable valve itself malfunctioned in seven of the 19 patients undergoing revisions, as documented by failure to open at an expected pressure by manometer testing. Of the remaining 12 patients, two developed signs and symptoms of increased intracranial pressure, complications related to subcutaneous placement of the bone. One patient developed a wound infection two weeks s/p cranioplasty.
Conclusions: Decompressive hemiepicondylectomy is a useful procedure to manage mass effect from a variety of non-traumatic mass lesions in the pediatric population. Patients can survive and improve to be functionally independent. Storage of the bone in a subcutaneous abdominal pocket is safe and well tolerated. Decompressive hemiepicondylectomy should be considered for non-traumatic mass lesions in the pediatric population.
120. DECOMPRESSION HEMIEPICONDYLECTOMY HAS BECOME AN ACCEPTABLE ADJUNCT TO MANAGEMENT OF MASS EFFECT IN ADULTS. WE PRESENT OUR EXPERIENCE WITH DECOMPRESSIVE HEMIEPICONDYLECTOMY FOR NON-TRAUMATIC PEDIATRIC MASS LESIONS TO FURTHER DEFINE THE INDICATIONS, OUTCOME AND POTENTIAL COMPLICATIONS OF THIS PROCEDURE IN THE PEDIATRIC POPULATION.
Julian A. Mattiello, MD, PhD; Gregory W. Kair, BS; Dianna M. E. Bardo, MD; Kurt Hepps, MD, PhD; Michael Kliem, MD; Charles Marcucilli, MD, PhD; David M. Prim, MD, PhD (Chicago, IL)
Introduction: For children with intractable epilepsy, identification of more than one seizure focus is considered a contraindication to surgical resection. We present a series of patients with intractable epilepsy in whom decompressive hemiepicondylectomy for independent epileptogenic foci were resected.
Methods: Evaluation included imaging, electroencephalography and electrocorticography. Imaging and spatiotemporal data (including magnetic resonance, position emission tomography, and mass spectrometry) did not yield information that could be used to discriminate epileptogenic from electrically normal tissue. Seizure electrophysiological data included regional data of abnormal electrical activity. Following surgical placement of cortical grids and strip electrodes, the data obtained during continuous video-electrocorticographic recordings were used to identify two independent, spatially distinct foci.
Results: In all cases, non-adjacent topographies were performed in two lobes during a single operation. Surgical pathology identified abnormal cortical histology/ organisation in the affected tissues in all but one patient. Post-operative outcome data (average interval = 14 months) demonstrate that no patient experienced any new neurologic deficit (0%). One patient had no change (20%), and one patient had an increase in seizure activity (20%). Three patients (60%) were found to have a decrease in seizure severity or frequency. There was one mortality associated with a nosocomial bloodstream infection (20%). One patient (20%) was able to attend school after surgery.
POSTER ABSTRACTS

122. SALVAGING THE "LOST" PERNITIUM AFTER VENTRICULOATRIAL SHUNT FAILURE
R. Richard, MD, Mike Chen, MD, David W. Pincus, MD, Gainesville, FL
Introduction: Ventriculoatrial (VA) shunting remains the mainstay of management for the majority of pediatric patients with communicating hydrocephalus. For patients who have repeat distal failures or recent peritonitis, ventriculoatrial (VA) shunting is often the next choice. However, VA shunts may be complicated by venous thrombosis, distal failure from cava/sinusus, bacteremia, and rarely, endocarditis. When VA shunts fail, options include VA shunt revision, shunt to the peritoneum, cranial vault, or subarachnoid or subdural spaces. Each of these has technical difficulties as well as potential operative and perioperative complications. Since we feel that VP shunting remains the safest and least complicated method for the long term management of communicating hydrocephalus, we have used a strategy of attempted peritoneal salvage in patients with histories of intractable ventriculoatrial shunt failures. Methods: Between 2000 and 2003 at the University of Florida, six patients with chronic hydrocephalus were treated with VP shunts following failure of VA shunts. All patients had been found to have inappropriate peritoneal cavities for VP shunting by previous neurourologues due to infection or recurrent distal failures. Most cases, children underwent laparoscopy to salvage peritoneal spaces for CSF shunting. This was done with the assistance of a pediatric surgeon. Results: The mean follow-up of 1.5 years reveals no evidence of shunt malfunction in this small group of patients. Converting back to a VP shunt following a VA shunt failure is possible if a suitable peritoneal pocket is found.

123. VENTRICULO-PERITONEAL SHUNT COMPLICATION RATES POST ABDOMINAL SURGERY IN PATIENTS WITH SPINA BIFIDA
John Thomas, MD, Paul Leach, MD, DMSc, Malcolm Lewis, Joanne Shaw, AFRCS (Safford Manchester, United Kingdom)
Introduction: Shunt complications following abdominal surgery are well recognized. Because of the need for continence procedures patients with spina bifida often require laparoscopy. We present the shunt complication rate in this group.
Methods: A regionally prospectively collected spina bifida registry of 270 patients, though with ventriculoatrial shunts, had had abdominal surgery were included. A case note review was then undertaken to establish the incidence of shunt complications. Type of surgery and cause of complication were recorded.
Results: Fifty-seven abdominal procedures were performed in 39 patients. Nine patients had shunt dysfunction, requiring neurosurgical intervention, within three months of surgery. The overall risk of shunt malfunction was 15.8%.
Conclusions: Shunt malfunction is common after major abdominal surgery in patients with spina bifida. Patients and their families need to be counselled appropriately prior to surgery. Abdominal surgery in patients with spina bifida and hydrocephalus should be carried out in units with neurosurgical on-call cover.

124. BRAIN STEM STEREOTACTIC BIOPSY IN CHILDREN
David W. Pincus, MD, PhD, Anthony Yachnis, MD, Amy Smith, MD (Why Hospital, Long Island, NY)
Introduction: While it is widely accepted that biopsy is not indicated for the diagnosis and empiric treatment of diffuse pontine glioma it is not unusual to encounter patients with brain stem lesions that cannot be diagnosed on the basis of imaging studies only. In many of these cases, stereotactic biopsy is necessary to make appropriate treatment recommendations.
Methods: We retrospectively reviewed our institutional experience with stereotactic biopsy in pediatric patients over a three year period. Nine patients underwent biopsy of brainstem lesions using a three-dimensional graphics workstation for targeting.
Results: Two patients experienced mild diplopia postoperatively. No other morbidity and no mortality was noted. Pathologic diagnosis included dedifferentiated low grade astrocytoma (three), glioblastoma (one classic and one giant cell variant), recurrent medulloblastoma, and demyelination. Two extremely unusual histologies, ependymal astrocytoma and microglial tumor, were also encountered.
Conclusions: This small series suggests that brainstem stereotactic biopsy in children is a safe procedure with high diagnostic yield. The finding of varied diagnoses indicates that conventional radiologic findings are not consistent with diffuse pontine glioma, stereotactic biopsy should be considered.

125. ARE MAGNETIC RESONANCE SCAN FINDINGS PRECISE PREDICTORS OF BLADDER AND BOWEL DISFUNCTION IN SPINA BIFIDA OCCULTA
John A. Thome, MD, Paul Leach, MD, John C. Reves, MD, FACS (Manchester, United Kingdom)
Introduction: To assess the risk of bladder and bowel neuropathy in spina bifida occulta patients.
Methods: The magnetic resonance imaging of 69 patients (43 females, 26 males) between the ages of 3 and 62 median age 10 years was reviewed. From MRI findings three groups were identified. Group one had sacral agenesis / hypoplasia or evident degeneration. Group two had a meningocele or epomyselomeningocele but not features of group one. Group three had other lesions.
Results: Thirty-five (50.7%) had a neuropathic bladder and bowel. Twenty-two (31.9%) had lower limb neurological abnormalities but only 11 of these had bowel and bladder neuropathy. The risk of bladder and bowel neuropathy was significantly greater in Group one patients. Of 17 patients in group one, 15 (88%) had bladder and bowel neuropathy, compared to nine of 14 in group two (64%) and 11 of 38 (29%) in group three (Group one vs Group two and three, p = 0.0001; group one vs group three, p < 0.0001, group two vs group three, p = 0.0276). For those in Group three there was no relationship between MRI findings (longtermed cord, lipoma, dastem and split cord or syringomyelia) and the presence of bladder and bowel neuropathy.
Conclusions: This data is important information for antenatal and postnatal counselling. It may also help guide the investigation and management of these patients. The low rate of bladder and bowel neuropathy in Group 3 patients raises a questionmark over the role of prophylactic surgery in this group.

126. REFERRED SHOULDER PAIN FROM VENTRICULO-PERITONEAL SHUNTS
James W. Curtis, Jr., MD, R. Shane Tubbs, PhD, John C. Weilong, MD, Jeffrey P. Blount, MD, Paul A. Grabb, MD, W. Jerry Coles, MD (Birmingham, AL)
Introduction: Three pediatric patients with ventriculo-peritoneal shunts who presented with chronic right shoulder pain and radiographic findings that revealed the distal peritoneal catheter was positioned between the right hemipachymedaph and rib. Following surgical repositioning of the distal tubing, all patients had resolution of their shoulder pain.
Methods: The clinical history and imaging data of three patients were reviewed. Each patient presented with right shoulder pain.
Conclusions: Although seemingly rare, referred shoulder pain from a ventriculo-peritoneal shunt should be considered in the list of complications seen with this method of cephalomedullary fluid diversion. The clinician who cares for patients with ventriculo-peritoneal shunts may wish to evaluate cases of shoulder pain without obvious neural or muscularkeletal cause with imaging of the distal shunt tubing. The pain can be similar to and potentially mistaken for choleystitis.

127. PATTERNS OF TUMOR PROGRESSION AND RECURRENCE IN PEDIATRIC PLOCTYOSTMA ACTINOMYOTOMY
Jonathan L. Loker, MD, J. Gordon McDonald, MD, Jia E. Bowan, BA, Mark D. Krieger, MD (Los Angeles, CA)
Introduction: Pitocytic astrocytomas are associated with prolonged survival, depending on tumor location, resection, and recurrence. Understanding patterns of recurrence would increase vigilance where indicated, and patient reassurance where indicated.
Methods: A 10 year series of consecutive patients treated at one institution was analyzed retrospectively with RB approval. The patients' medical records were reviewed in their entirety. All histological diagnoses were confirmed on blinded review. Forty-nine patients were diagnosed with pitocytic astrocytomas from January 1994 to January 2004. There were 25 (51%) male and 24 (49%) female patients. The average age at diagnosis was 80.8 years, and the average follow-up was 3.7 years. Thirty-one (63%) patients underwent gross total resection (GTR) by both surgical and radiographic reports, and 18 (37%) underwent subtotal resection or biopsy (STR).
Results: 4 (6.2%) patients had recurrent disease with GTR, and 10 (20%) had progressive disease with STR. Time to recurrence was 2.3 years for patients with GTR, and 0.74 years for patients with STR (p=0.04). 87.5% of the progressions were detected by surveillance scanning, while 12.5% were detected by new symptoms which prompted an imaging study. Age, sex, presentation, and tumor location did not factor into this analysis. All progressions occurred within the period predicted by Collins Law, and 13/16 occurred in 2 years.
Conclusions: Recurrence or progressive disease is predicted by the degree of surgical resection. GTR confers a longer event-free survival than STR. Recurrence or progression typically occur within 2 years, which should be the period of heightened vigilance. Surveillance scanning is beneficial in following these patients.

128. CLINICAL CHARACTERISTICS OF SPINA BIFIDA PATIENTS REQUIRING SURGERY FOR TETHERED CORD
Malalith R. Raju, MD, Sethi Krishnamurthy, MD, Nenle Doss, MD, MPH (Syracuse, NY)
Introduction: Spina bifida (SB) is associated with many neurological abnormalities. Although the prevalence of tethered or low-lying cords in SB is high, not everyone undergoes surgical correction of their tethered cords. We explored the functional status of SB patients with and without tethered cords requiring surgical correction (TCS), and the likelihood of having associated abnormalities including hydrocephalus and seizures.
We performed a case control study of 219 patients followed in our SB clinic between 1980-2004. Patients' functional status was reported using the Functional Independence Measure (FIM). FIMs and body mass index (BMI) were analyzed using the t test. Prevalence of hydrocephalus and seizures were analyzed using the chi square test.
Results: Mean FIMs for patients with TCS was 103.52. Without TCS was 88.40. The means' difference was 15.12 points (95% CI: 7.53-22.66). For BMI, the respective means were 23.22 and 23.62 and means' difference was 0.39 (24.41 - 1.625). The odds ratio of having seizures was 0.584 (CI: 0.285 - 1.194) and of hydrocephalus requiring shunting was 0.188 (CI: 0.104 - 0.349), in patients with TCS versus those without.
Conclusions: There was no difference in the body mass index, no difference in the body mass index, no difference in seizures between those SB patients requiring and not requiring surgery for TC. On the other hand, patients with TCS surgery have a better functional score and have a reduced prevalence of shunted hydrocephalus. The improved functional status and reduced prevalence of hydrocephalus urge the clinician to actively seek symptoms of TC in SB patients to prevent permanent neurologic dysfunction.
129. A NOVEL MODEL OF PRIMARY SPINAL CORD TUMORS IN RABBITS: FUNCTIONAL, RADIOLOGICAL, AND HISTOPATHOLOGICAL CHARACTERIZATION
Gustavo Paredes, MD, Gaurav Makhani, BS, Federico G. Legnani, MD, Betty M. Tyler, BA, Neha Gosalia, BA, Jonathan Pindick, BS, Alia Hobe, BA, Carlos M. Bagley, MD, Henry Bem, MD, George Jallo, MD (Baltimore, MD)

Introduction: Intramedullary spinal cord tumors in children are often surgically incurable and current options are limited. The creation of an animal model would be an asset for testing novel chemotherapeutic paradigms. We report the technique, functional progression, radiological appearance, and histopathological features of a novel intramedullary tumor model in rabbits.

Methods: Ten New Zealand white rabbits were randomized into two experimental groups. Animals in group 1 received an intramedullary injection of 25 mL of 2x10^7 cells/mL of WR2225-34 tumor cells. Rabbits in group 2 received an intramedullary injection of 25 mL of Dulbecco modified Eagle medium. The animals were imaged with MRI pre-operatively and weekly after surgery until onset of hind limb paraparesis, at which point the rabbits were sacrificed, and spines were harvested for histopathological analysis.

Results: Animals in group 1 had a statistically significant mean onset of painless of 17 ± 2 days (P<0.001, Log-rank) after tumor implantation, compared to group 2 animals which lacked neurological deficits by day 45 post-injection. MRI confirmed space-occupying lesions, with acute ischemic cord changes in all animals implanted with VX2. Histopathological analysis confirmed extensive invasion of the spinal cord with marked ischemia and necrosis. Control animals showed no significant radiological or pathological abnormalities.

Conclusions: Clinical progression was consistent in all the VX2 injected animals, with paraparesis occurring 17 ± 2 days after tumor injection. Functional and radiological characteristics of the intramedullary VX2 tumor are comparable to those of primary human spinal cord tumors. The establishment of this intramedullary tumor model will allow the testing of new treatment paradigms.

130. A NOVEL RAT MODEL FOR INTRAMEDULLARY SPINAL CORD GLIOMA
Gaurav Makhani, BS, Gustavo Paredes, MD, Federico G. Legnani, MD, Betty M. Tyler, BA, Neha Gosalia, BA, Jonathan Pindick, BS, Alia Hobe, BA, Carlos M. Bagley, MD, Henry Bem, MD, George Jallo, MD (Baltimore, MD)

Introduction: The majority of pediatric intramedullary spinal cord gliomas are of glial origin. However, the absence of an adequate animal intramedullary model has hindered the development of new treatment paradigms such as local delivery of chemotherapeutic agents. In this study, we describe the technique for intramedullary injection of an experimental glioma in rats and present the methodology for functional and histopathological analysis of tumor progression.

Methods: Female Fischer-344 rats weighing 150-200 gms were anesthetized, a 2 cm incision was made in the dorsal mid-thoracic region, and the spinous process of two adjacent vertebrae were removed to expose the intervertebral space. The ligamentum flavum was removed and a 3 mm suspension containing 100,000 VX2 glioma cells was injected into the spinal cord. Control animals were injected with 3 ml of DMEM/Dulbecco's modified Eagle medium. Animals were evaluated daily for signs of paralysis and euthanized after onset of deficits for histopathological analysis.

Results: Animals injected with 9L glioma developed bilateral hind limb paralysis on day 10 after injection. Animals injected with DMEM/Dulbecco's medium developed no neurological deficits. HE and cross sections confirmed the presence of intramedullary 9L glioma invading the spinal cord (Figure 1). Control animals had no significant histopathological findings.

Conclusions: Animals injected with 9L glioma cells consistently develop hind limb paraparesis 10 days after tumor injection. Histological characteristics of intramedullary 9L are comparable to those of intracranial 9L glioma, a widely accepted experimental model of human gliomas. This model can be used for preclinical testing of novel local delivery therapeutic agents.

131. CORPUS CALLOSUM: AN OLD THERAPEUTIC TECHNIQUE AS A NEW DIAGNOSTIC APPROACH TO IDENTIFYING RESECTABLE EPILEPTOGENIC FOCS
James E. Baumgartner, MD (Houston, TX)

Introduction: The corpus callosum is the principal anatomic and neurophysiologic tract linking the cerebral cortices. Neuronal signal transmission is achieved via this vast network of axons to contralateral homotopic regions. Signals via this tract allow the spread of epileptiform discharges between hemispheres. In epilepsy, generation of secondary generalized seizures is dependent on propagation of synchronous bilateral discharges. Interruption of signal transmission via this pathway can inhibit seizure generalization. Corpus callosotomy was developed to prevent epileptiform synchronization, particularly for seizures with rapid propagation. Locally these seizures lack focalizing features of EEG and imaging studies. We describe five cases of intratable epilepsy whose focal features did not appear until corpus callosotomy was performed.

Methods: Five patients with refractory epilepsy were operated on (including MRI, EEG, MEG and neuropsychological testing) which did not suggest focal seizure onset. All underwent corpus callosotomy, and repeat post-evaluation post-callosotomy revealed focal seizure onset with localizing ictal and interictal EEG pattern changes. These patients were subsequently operated on for improvement of their symptoms. At follow-up, the patients remain clinically stable.

Conclusions: Correlative callosotomy can be used as both a therapeutic and diagnostic tool in the management of some refractory epilepsies.

132. PRIMARY PROGRESSIVE TONSILLAR HERNIATION IN CHIARI I MALFORMATION
Timothy G. Gaitanakis, MD (Durham, NC)

Introduction: Primary tonsillar herniation in Chiari I malformation is described as principally a secondary phenomenon. Two cases are described in which progressive symptoms correlated to progressive tonsillar herniation without any other clear antecedent cause.

Methods: A 26 y/o male was followed for developmental delay and severe dysarthria, and was noted to develop worsening headaches, stridor and gait ataxia. A 16 y/o female with rapid symmetric decline in speech was followed for progressive occipital headaches, left arm and hand weakness, with worsening headaches in spite of controlled hypertension. ICP monitoring demonstrated normal intracranial pressure. Ophthalmologic examination failed to demonstrate papilledema or visual field deficit in either patient. Neither patient underwent a lumbar puncture, lumbar CSF diversion, or had MRI evidence of intracranial hypertension.

Results: Initial MRI in both cases demonstrated Chiari I malformation with minimal tonsillar descent of 2 mm and 5 mm respectively. Follow-up imaging was obtained due to progressive symptoms that revealed progression of tonsillar descent of 10 mm and 21 mm without substantial cerebellar, ventricular, or other abnormality, respectively. Both patients underwent posterior fossa decompression with improvement of their symptoms. At follow-up, the patients remain clinically stable.

Conclusions: Progressive tonsillar descent documented by MRI has been attributed as a phenomenon secondary to a progressive high-pressure intracranial process. Low-pressure intracranial process, or congenital anomalies. Two cases are reported in which symptoms and tonsillar herniation progressed as a primary process.

133. SLO: THE APPLICATION IN DETECTING INCREASED INTRACRANIAL PRESSURE
Jeffrey E. Carmi, MD, Sr., MD, Charles J. Prestiagiacomo, MD, Wenthsin Lee (Newark, NJ)

Introduction: The diagnosis of papilledema is an important clinical entity especially in pediatric neurosurgery. An objective supplement to the clinical examination using modern technology is needed. This study evaluates the use of the Heidbrink scanning laser ophthalmoscope (SLO) to investigate papilledema.

Methods: Patients with no underlying pathology were examined with the SLO for normative data. Digital retinal images centered on the optic nerve head were obtained and assessed for optic nerve head height and presence/absence of edema. Potential differences in these parameters elicited by postural changes were assessed in six normal volunteers. In the second phase of the study, we compared normative data with patients suspected of having raised intracranial pressure.

Results: The paired t-test was used to assess for possible postural changes in SLO measurements. Our results demonstrate no statistically significant differences between standing and supine positions. Thirteen patients with clinical evidence of increased intracranial pressure were examined, and the data set was compared with 30 normal volunteers. Data analysis revealed usually demonstrable differences in the optic nerve when compared to normal patients. However, current software does not demonstrate a statistically significant difference.

Conclusions: Though currently used in the glaucoma patient population, SLO's 3-D ability to objectively evaluate the retina and the optic nerve head makes this technology a promising new tool in diagnosing papilledema.

134. MENINGIOMAS IN CHILDREN
Stephanie Greene, MD, Chong C. Lee, MD, PhD, Jeffrey G. Gjemlan, MD, Richard G. Ellenberger, MD, Anthony M. Avellino, MD (Seattle, WA)

Introduction: Pediatric meningiomas are a clinical rarity, representing 0.5-4.2% of all pediatric intracranial tumors. They are often seen in association with radiation therapy (RT) or neurofibromatosis type II (NF-II). These tumors are reported to be slightly more common in males, more often seen in an intraventricular location, and more likely to be multiple. We report one recent case of an intraventricular meningioma, and review the epidemiology, pathology, and natural history of eighteen additional cases of childhood meningiomas from this institution.

Methods: The Seattle Children's Hospital and Regional Medical Center brain tumor database was surveyed for patients presenting with meningiomas between the years of 1940 and 2004. Eighteen additional patients were identified, and a retrospective chart review was performed.

Results: Of the 19 patients (10 [53%] were male. Ages ranged from 3 to 16 years with a median of 12. Five (26%) patients had NF-I, and four (21%) had previously undergone RT. The tumor subtypes were five meningotheliomatous, four transitional, two malignant, two atypical, one papillary, one clear cell, and four were not subclassified. Six (32%) patients had recurrent disease, including two malignant meningiomas, one patient with NF-II, and one with an RT history. Four (21%) patients died.

Conclusions: A minimal male predominance was shown in our series. The intraventricular location was less common in our series than in others. These tumors demonstrated a more aggressive course than those in adults, with a much higher mortality rate. Pediatric meningiomas is an important entity distinct from that seen in adults.
135. SUBAXIAL CERVICAL STENOSIS WITH MYELOPATHY IN CHILDREN WITH ACHONDROPLASIA: CASE REPORT
John K. Haughton, MD; David Gordon, MD; James T. Goodrich, MD, Ph.D (Bronx, NY)
Introduction: Spinal stenosis is common in achondroplasia due to congenital and acquired anatomical abnormalities including short, thickened pedicles and hypoplastic intervertebral discs. Children tend to become symptomatic from compression at the foramin magnum and upper cervical spine. Symptomatic stenosis in the subaxial cervical spine is rare and has not previously been reported in a child. We report the findings and management of a 7-year-old patient with quadraparesis from extensive subaxial cervical stenosis.
Methods: A 7-year-old female with a history of two prior suboccipital decompressions for foramin magnum compression presented after six months of progressive quadraparesis. An MRI revealed stenosis from C2-T1 confluent spinal cord compression and extensive T2 signal abnormality at the C4 and C5 levels. A CT scan reformatted in the sagittal plane revealed kyphotic deformity of 31 degrees from C5-T1.
Results: A C2-T1 laminectomy was performed. Fusion with instrumentation was added from C2-T2 secondary to the presence of preoperative kyphotic deformity. Fixation consisted of C2 pars screws, C4-6 lateral mass screws, and T1-2 pedicle screws, with C3 and C7 screws omitted secondary to anatomical considerations. The patient recovered partial function with improved ability to walk, though quadraparesis persisted. There were no surgical complications.
Conclusions: Subaxial cervical stenosis with spinal cord compression is a rare finding in children with achondroplasia that may cause symptoms of progressive myelopathy. This entity should be considered in achondroplastic children with symptoms of myelopathy, particularly if the more common finding of foramin magnum compression is not present or has previously been treated.

136. CYTOTOXICITY AND IN VIVO SAFETY OF CARBOPlatin AND MINOCYCline FOR THE TREATment OF MALIGNANT GLIOMA
Gretel J. Zama-Berardi, BA; Federico G. Legnani, MD; Gustavo Pazzola, MD; Samuel Herbert, BA; Betty M. Tyler, BA; Henry Brem; Alejandro Olivo (Baltimore, MD)
Introduction: Efficacy of carboplatin (alkylating agent, used in combination with minocycline (anti-angiogenic), was studied in an experimental rat glioma model. In vivo cytotoxicity of the combined therapy, delivered intravenously via controlled-release polymer, was assessed and safety was established.
Methods: Rat (9L, gliosarcoma, P98 and C6 glioma), human (U251/50glioma) and metastatic breast carcinoma (MCF-7/3) were grown subcutaneously in mice. Tumor-bearing animals were treated with carboplatin (20ug/m), minocycline (25ug/m), and a combination of both agents for 72 hours, with controls receiving no treatment. To establish safety of the combination treatment, 2% and 5% carboplatin, and 50% minocycline polymers were implanted into four groups of 34-34 rats (3 animals/group). Groups one and two received carboplatin 2% and carboplatin 5% polymers alone respectively; groups three and four received carboplatin 2%/minocycline 50% and carboplatin 5%/minocycline 50% combination treatments respectively. The animals were evaluated and weighed on the day of surgery, and at various days thereafter.
Results: Efficacy of combination treatment was assessed in vitro using 9L, P98, C6, and U251 cell lines. Combination treatment significantly decreased cell growth compared to controls (p<0.001), and was more effective than carboplatin or minocycline alone. Drug-related toxicity in vivo was apparent in the carboplatin 5% and carboplatin 5%/minocycline 50% combination groups with 33.3% and 66.6% survival 21 days post-operatively respectively. Safety for carboplatin 2% alone and carboplatin 2%/minocycline 50% combination was established with 100% survival in both groups 25 days post-operatively.

137. POSTERIOR LUMBAR INTERBODY FUSION UTILIZING ALLOGRAFT IN CHILDREN - A REPORT OF TWO CASES
Josh Miller, MD; Scott W. Elton, MD (Columbus, OH)
Introduction: Congenital paras interarticularis defects in children are unusual, but they can lead to disabling lumbar pain, radiculopa thy, sensory changes, and motor deficits. Many of these children present with radiologic signs of spinal instability. In the past, these were treated with bracing and, subsequently, with posterior tethered fusion and fixation. We describe a new technique utilizing allograft interbody fusion.
Methods: Ten adolescents, one male and one female, presented with a combination of back pain, parasthesias, and radiculopathy. Workup consisted of plain radiographs, flexion-extension radiographs, and MRI. Both were treated conservatively, and both failed to respond. The two patients then underwent posterior laminectomy, discectomy, allograft interbody fusion, and pedicle screw fixation.
Results: Six months follow-up, both children have demonstrated solid fusion with no graft complications. Both have returned to full and normal activity.

Conclusions: Posterior lumbar interbody fusion utilizing allograft bone can be safely performed in children. This avoids several site graft complications, shortens postoperative recovery, and is likely to have a high rate of fusion compared to standard posterior tethered fusion techniques. Much more work remains to be done to assess new interbody fusion technologies in children.

138. IMPLANTATION OF AN ADDITIONAL GRAVITATIONAL UNIT IN SHUNTED PEDIATRIC HYDROCEPHALUS PATIENTS WITH OVERDRAINAGE SYNDROME
Marina Messing-Jueder, MD; Jasmin Dwaher-Eisenach, MD (Dusseldorf, Germany)
Introduction: Overdrainage syndrome in children features headache (instability), vomiting, somnolence and sometimes vegetative signs with tachycardia and peripheral vasovasodilation. CFT or MRI reveal tight ventricles in many cases or at least a dysharmony between ventricular size (small) and cisterns (wide). If such a syndrome is frequent and no adjustable shunt system is already implanted surgical revision is recommended. In our institution the essential part of revision was the implantation of an additional gravitational unit (ShuntAssistant, Fa. Mitekra, Germany).
Methods: In order to evaluate the indication of this operation we retrospectively investigated the clinical course and brain images of 14 pediatric patients (0.1-13.5 years, mean 7.9 y). In 13/16 cases the ShuntAssistant was combined with a programmable valve. The follow up period ranged from 1 to 55 months (mean 21.8 mo).
Results: In 10/14 children no further overdrainage episodes could be observed, 4/14 children developed only single and less severe episodes. Changing the valve's opening pressure alone did not influence the symptoms. No complications and no underdrainage occurred. The ventricular width did not change.

Conclusions: Adding a gravitational unit to a preexisting or newly inserted shunt system is able to reduce the frequency and/or severity of an overdrainage syndrome in shunted hydrocephalic children.

139. TRANSIENT VENTRICULOPERITONEAL SHUNT dysfunction IN MYELODYSPLASTIC CHILDREN WITH URINARY BLADDER infection
James W. Cuttis, Jr, MD; R. Shane Tubbs, PhD; John C. Wettens III, MD; Jeffrey P. Blount, MD; W. Jerry Oaks, MD (Birmingham, AL)
Introduction: Shunt dysfunction for hydrocephalus can result from many mechanisms. To our knowledge, transient shunt malfunction in the presence of a significant urinary bladder infection that is reversed following only medical treatment of the bladder infection has not been reported.
Methods: The clinical history of children with myelosuppressive and hydrocephalus who presented with signs and symptoms of shunt dysfunction and a significant urinary bladder infection were reviewed. We found a patient population that resolved the symptoms of their shunt dysfunction after appropriate treatment for their urinary bladder infection. None underwent surgical manipulation of their CSF shunt.
Conclusions: Based on these patients, we believe that significant urinary bladder infection in the shunted myelosuplastic population may be enough to bring a subclinical shunt malfunction to clinical attention or may be enough to cause temporary distal peritoneal shunt malfunction. The mechanisms for the dysfunction is unclear. Treatment of the urinary bladder infection resolved the symptomatic shunt dysfunction without operative intervention in this group. However, we emphasize that careful observation of these patients should be made during hospitalization.

140. FAILURE PATTERNS AND LONG TERM OUTCOME IN PEDIATRIC patients TREATED FOR CRANIOHYPOGONIA
Jeffrey R. Leonard, MD; Lill Lin, MD; David Mearns, MD (St. Louis, MO)
Introduction: The aim of our study was to assess the long-term results and failure patterns of pediatric patients treated with surgery and/or radiotherapy for craniohypogonia.
Methods: Records of 31 patients treated at our institution for craniohypogonia were reviewed (1970-2002). Fourteen patients underwent gross total resection with observation, and six patients underwent limited resection with observation. Ten patients had a limited resection followed by external beam radiotherapy (EBRT) and one patient underwent cyst aspiration followed by F32 intrathecal instillation. Mean dose of EBRT delivered was 4600 cGy (3922-5400 cGy).
Results: OS and RFS at 5 years was 96% and 54%, respectively. One patient died of disease. Twelve patients had a subsequent recurrence. Of those six, five had initial limited resection with observation and six had gross total resection (GTR) with observation: Mean time to recurrence was 18.5 months for patients that underwent limited resection, and 68.7 months for patients that underwent GTR. At the time of recurrence, 3/12 patients underwent limited resection and observation, 3/12 patients underwent limited resection and EBRT, 6/12 patients underwent EBRT without resection. The three patients were treated without follow up had a second recurrence. 8 yrs RFS for the 11 patients that received initial RT was 100%. 8 yrs RFS for the 20 patients that did not receive initial RT was 28%.
Conclusions: Overall survival for pediatric patients with craniohypogonia is excellent. Radiotherapy continues to play a key role in the management of craniohypogonia both following subtotal resection and at the time of recurrence.
POSTER ABSTRACTS

141. SIX YEARS EXPERIENCE WITH THE FIRST GRAVITATIONAL SHUNT FOR CHILDREN: THE PAEDI-GAV
Regina Emanni, MD, Michael Kirker, MD
(Fromburg-Saw, Germany)

Introduction: The typical symptoms of overdrainage accrue with the beginning of independent sitting and walking. An increasing spiking with ongoing growth aggravates the consequences of overdrainage and fixes them irreversible.

The PAEDI-GAV is the first paediatric shunt with a gravitational unit for children.

Methods: Within the last six years, 70 children with hydrocephalus of various etiologies received a PAEDI-GAV. In 15 children we inserted the valve to compensate for sequelae of overdrainage induced by conventional differential valve without compensation of spiking. In 55 children the PAEDI-GAV was the first treatment of the hydrocephalic condition, mostly during the first three months of life.

Results: In all children who received the PAEDI-GAV to compensate for overdrainage this objective could be reached. Those children who received the PAEDI-GAV as initial treatment presented no signs of overdrainage (including a normal development of the head circumference) during the first three years of life. However 30% of the children dropped gradually from the 50th percentile to the 10th and below when their height increased thereafter.

Conclusions: The PAEDI-GAV prevents overdrainage in children in the first two to three years of life. Thereafter, the hydrostatic pressure, which has to be compensated, increases with growth necessitating a higher opening pressure of the gravitational unit. An adjustable gravitational unit would be valuable to overcome the necessity of an operation to adjust the adequate hydrostatic compensation.

NOTES

ROBERT ABBOTT, MD
Children’s Hospital at Montefiore
3316 Rochambau Ave.
Bronx, NY 10467

JAFI MELN, ABDUL-HAM, MD, PHD
Jalen Hospital USSR Khabir Karian
Kota Bharu Kleton 16150
Malaysia

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

NEJAT Aklan, MD
Hacettepe University Sch. of Med.
Dept. of Neurosurgery
Ankara 06100
Turkey

L. Leland Alfred, MD
Children’s Hosp. of Pittsburgh
3705 5th Ave./Neurosurgery
Pittsburgh, PA 15213-2524

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

A. Loren Amacher, MD, FRSCC
78 Fay Ln.
Lewisburg, PA 17837

Luis V. Amador, MD
Ste 336 1440 Veteran Ave.
Los Angeles, CA 90024-4352

Ahmed S. Ammar, MD, PHD
King Fahd Military Medical Complex
Building 71 Flt 602
Dhahran 31932
Saudi Arabia

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

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

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

RICK ABBOTT, MD
Children’s Hospital at Montefiore
3316 Rochambau Ave.
Bronx, NY 10467

JAFI MELN, ABDUL-HAM, MD, PHD
Jalen Hospital USSR Khabir Karian
Kota Bharu Kleton 16150
Malaysia

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

NEJAT Aklan, MD
Hacettepe University Sch. of Med.
Dept. of Neurosurgery
Ankara 06100
Turkey

A. Loren Amacher, MD, FRSCC
78 Fay Ln.
Lewisburg, PA 17837

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

A. Loren Amacher, MD, FRSCC
78 Fay Ln.
Lewisburg, PA 17837

Luis V. Amador, MD
Ste 336 1440 Veteran Ave.
Los Angeles, CA 90024-4352

Ahmed S. Ammar, MD, PHD
King Fahd Military Medical Complex
Building 71 Flt 602
Dhahran 31932
Saudi Arabia

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

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

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

PATTI A. ARONIN, MD
Texas Neurosurgery for Children
1215 Red River St. Ste. 232
Austin, TX 78701

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

WILSON T. ASHMORE, MD, FRSCC
MB Ste
101 1500 W. 22nd St.
Squaw Falls, SD 57105

SALAH S. BAASSA, MD, FRSCC
Kings County University Med. Cm.
PO Box 8022
Binghamton, NY 13902

SADIAA ARABIA

WALTER L. BAILEY MD
500 River St.
Minneapolis, MN 55401

GERRY A. BAILIS, MD, FACS
Neurological Surgeons Associates
300 E. Fletcher Ave., Ste. 340
Tampa, FL 33613-4645

STEVEN J. BARNET, MD
Abiting Neurosurgical Associates
2510 Maryland Rd. Ste. 185
Willow Grove, PA 19090-1134

HENRY M. BARKOWSKI, MD, PhD
Akon Childrens Hospital
1 Perkins Square Dr. 3411
Akon, OH 44308-1062

JAMES E BERGMANN, MD
3418 Georgetown St.
Houston, TX 77005-2910

ROBERT M. BASKETT, MD
Neurosurgery of Kansas City
19919 Parallel Pkwy. Ste. 455
Kansas City, KS 66112

WILLIAM O. BELT
Carolina Neurosurgical Associates 2810 N.
Maplewood Ave.
Winston-Salem, NC 27103-4138

MICHIEL S. BERGER, MD, FACS
UCSF/Dpt. of Neurosurgery
505 Parnassus Ave. M-786
San Francisco, CA 94143-0112

J. A. BERMUDEZ, MD
Children’s Hospital/Dept. of Neurosurgery
200 Henry Clay Ave.
New Orleans, LA 70118

KARIN B. BIERBRAUER, MD
Temple University Hospital
3401 N. Broad St. Ste. 658
Philadelphia, PA 19140-5103

PETER M. BLACK, MD, PhD
Children’s Hospital/Brinker & Woman’s Hospital
75 Francis Street
Boston, MA 02115-5724

JEFFREY B. BLOUNT, MD, FACS
Children’s Hospital of Alabama
1600 7th Ave. S. ACC 400
Birmingham, AL 35233

JOHN SCOTT BOOBS, MD
Ste. 104
1820 Bar St.
Jacksonville, FL 32204

FREDERICK A. BOOP, MD, FACS/ Sommes Murphey Clinic
1211 Union Ave., Ste. 200
Memphis, TN 38104-3562

WILLIAM R. BOYDTON, MD
Pediatric Neurosurgery Associates
5405 Memdrd Mark Rd. Ste. 540
Atlanta, GA 30342-1640

DOUGLAS L. BROOKMYER, MD
Primary Children’s Medical Center
100 N. Medical Dr. Ste. 2400
Salt Lake City, UT 84113-1103

JEFFREY A. BROWN, MD, FACS
Ste. 116
600 Northern Blvd.
Great Neck, NY 11021-5200

DENIS A. BRUCE, MD
781 Milbrod Rd.
Nantucket, MA 02554

MICHAEL JAMES BURKE, MD, FACS
Neurosurgical Institute of South Texas
3643 S. Staples
Corpus Christi, TX 78411-2456

GEORGE T. BURSON, MD
Neurosurgery Arkansas
6901 Lisa Dr. Ste. 310
Little Rock, AR 72205

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AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY

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### 2004 MEMBERSHIP ROSTER

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark A. Mittler, MD</td>
<td>Long Island Neurosurgical Associates 410 Lakeview Rd. Ste. 204 New Hyde Park, NY 11042-1103</td>
</tr>
<tr>
<td>Richard H. Moser, MD</td>
<td>3666 Ella Lee Ln., Houston, TX 77027-4105</td>
</tr>
<tr>
<td>Jose L. Montes, MD</td>
<td>Montreal Children's Hospital 2300 Tupper St. Rm. CB19 Montreal, PQ H3H 1P3 Canada</td>
</tr>
<tr>
<td>Germany Montoya, MD</td>
<td>552 Virginia Dr., Orlando, FL 32803-1856</td>
</tr>
<tr>
<td>Leon E. Moses, MD</td>
<td>203 Kent Oak Way Gaherenburg, TX 78078-5614</td>
</tr>
<tr>
<td>Thomas M. Moriarty, MD</td>
<td>Kosair Children's Hospital 210 E. Gray St. Ste. 1102 Louisville, KY 40202-3907</td>
</tr>
<tr>
<td>William J. Morris, MD</td>
<td>915 6th Ave., Ste. 2 Tacoma, WA 98405-4662</td>
</tr>
<tr>
<td>Glenn Morrison, MD</td>
<td>Miami Children's Hospital 3020 S.W. 60th Ct. Ste. 301 Miami, FL 33155-4071</td>
</tr>
<tr>
<td>David M. Moss, MD</td>
<td>Phoenix Children's Hospital 1919 E. Thomas Rd. Phoenix, AZ 85016-7710</td>
</tr>
<tr>
<td>Michael S. Mulhauser, MD</td>
<td>Semmes Murphey Clinic 6325 Humphrey Blvd. Memphis, TN 38120-2300</td>
</tr>
<tr>
<td>Michael G. Muhr, MD</td>
<td>455 S. Main St. Orange, CA 92661-3835</td>
</tr>
<tr>
<td>Karin M. Muraszko, MD</td>
<td>University of Michigan F7054 Mot Children's Hospital Ann Arbor, MI 48109-0200</td>
</tr>
<tr>
<td>Arvi F. Muralbash, MD</td>
<td>P.O. Box 9102326 Aman 11191 Jordan</td>
</tr>
<tr>
<td>Owey A. Muzensky, MD, FACS</td>
<td>Children's Hospital of Wisconsin 9000 W. Wisconsin Ave., Ste. 405 Milwaukee, WI 53201-1997</td>
</tr>
<tr>
<td>S. Tanace Myliss, MD</td>
<td>Foothills Medical Center 1403-29 St. N.W. 11-12 Fl. Calgary, AB T2N-279 Canada</td>
</tr>
<tr>
<td>John S. Myers, MD</td>
<td>Cincinnati Children's Hospital 3333 Burnet Ave./Neurosurgery Cincinnati, OH 45229-3026</td>
</tr>
<tr>
<td>Joseph M. Nadel, MD</td>
<td>Children's Hospital 200 Henry Clay Ave. New Orleans, LA 70118-5720</td>
</tr>
<tr>
<td>Mahmoud G. Nagib, MD</td>
<td>305 Piper Bldg. 800 E. 28th St. Minneapolis, MN 55407-3799</td>
</tr>
<tr>
<td>Mark Stephen O'Brien, MD</td>
<td>889 W. Wesley Rd Atlanta, GA 30327</td>
</tr>
<tr>
<td>David P. Oakes, MD</td>
<td>Children's Hospital of Alabama 1600 7th Ave. S. ACC 400 Birmingham, AL 35233-1711</td>
</tr>
<tr>
<td>Michael S. Ongerman, MD</td>
<td>UW/Children's Hospital &amp; Regional Med. 4800 Sandpoint Way N.E. Seattle, WA 98105</td>
</tr>
<tr>
<td>Paul A. Pagani, PA-C</td>
<td>1916 Cypress View Dr Fort Myers, FL 33912-4825</td>
</tr>
<tr>
<td>Larry Keith Page, MD</td>
<td>13845 S.W. 73rd Ct. Miami, FL 33158</td>
</tr>
<tr>
<td>Dachling Pang, MD</td>
<td>Kaiser Permanente Hospital 280 W. MacArthur Blvd./Ped. Neurosurgery Oakland, CA 94611-2094</td>
</tr>
<tr>
<td>Andrew D. Parent, MD</td>
<td>University of Mississippi Medical Center 2500 N. State St. Jackson, MS 39216-4500</td>
</tr>
<tr>
<td>John G. Parks, MD</td>
<td>St. Louis Children's Hospital 1 Children's Pl. Ste. 4520 St. Louis, MO 63110-1002</td>
</tr>
<tr>
<td>Michael David Partington, MD, FACS, FA</td>
<td>Gillette Children's Specialty Healthcare 200 E. University Ave. St. Paul, MN 55101</td>
</tr>
<tr>
<td>Jorge V. Pattisapu, MD</td>
<td>Pediatric Neurosurgery 9A 58 W. Michigan St. Orlando, FL 32806-2037</td>
</tr>
<tr>
<td>Jerry G. Penes, MD</td>
<td>928 Holladay Point Virginia Beach, VA 23451</td>
</tr>
<tr>
<td>Joseph H. Potter, Jr., MD</td>
<td>St. Christopher's Hosp. for Children Erie Ave. at Front St. Philadelphia, PA 19134-1095</td>
</tr>
<tr>
<td>Pavan K. Pillay, MBBS, FACS</td>
<td>Asian Brain-Spine Nerve Center 3 Mt. Elizabeth #15-03 Singapore 2283010</td>
</tr>
<tr>
<td>Michael S. Pittman, MD</td>
<td>Children's Hospital of Pittsburgh 11600 Euclid Ave. RBC B501 Cleveland, OH 44106-1736</td>
</tr>
<tr>
<td>Thomas Pittman, MD</td>
<td>University of Kentucky Medical Center 800 Rose Sta. Rm. MS 105-B Lexington, KY 40536</td>
</tr>
<tr>
<td>Ian F. Pollock, MD</td>
<td>Children's Hospital of Pittsburgh 3700 5th Ave./Neurosurgery Pittsburgh, PA 15213-2524</td>
</tr>
<tr>
<td>Harold D. Portnoy, MD</td>
<td>Michigan Head &amp; Spine PLLC 44555 Woodward Ave. Ste. 506 Pontiac, MI 48341-2082</td>
</tr>
<tr>
<td>Mark R. Proctor, MD</td>
<td>Childrens Hospital 300 Longwood Ave. Bader 3 Boston, MA 02115-5724</td>
</tr>
<tr>
<td>Joseph V. Quarman, MD</td>
<td>DuPont Hospital for Children 1600 Rockland Rd. P.O. Box 269 Wilmington, DE 19899</td>
</tr>
<tr>
<td>Corey Rafeh, MD, PhD</td>
<td>Dept. of Neurosurgery E8B 200 First St. S.W. Rochester, NY 14605-0001</td>
</tr>
<tr>
<td>John Rahgab, MD</td>
<td>Miami Children's Hosp. Pediatric Neurosurgery 3200 S.W. 60th Ct. Ste. 301 Miami, FL 33136-2104</td>
</tr>
<tr>
<td>Mahmoud Rashidi, MD</td>
<td>2601 Osstell St. Ste. 101 Bakersfield, CA 93306</td>
</tr>
<tr>
<td>Donald H. Reigel, MD</td>
<td>5178 Polo Field Dr. Gibsone, PA 15044</td>
</tr>
<tr>
<td>Harold Louis Rekate, MD</td>
<td>Barnow Neurological Institute 2912 N. 3rd Ave. Phoenix, AZ 85013-4434</td>
</tr>
<tr>
<td>Theodore S. Roberts, MD</td>
<td>Children's Hospital Medical Center 4820 Sandpoint Way N.E. CH-50 Seattle, WA 98105</td>
</tr>
<tr>
<td>Shandosrah Robinson, MD</td>
<td>Rainbow Babies &amp; Children's Hospital 11100 Euclid Ave. RBC B501 Cleveland, OH 44106-1736</td>
</tr>
<tr>
<td>Walker L. Robinson, MD</td>
<td>Carle Clinic and Foundation Hosp. 622 W. University Ave. Urbana, IL 61801</td>
</tr>
<tr>
<td>Luis A. Rodriguez, MD</td>
<td>Memorial Healthcare 1150 N. 35th Ave. Ste. 300 Hollywood, FL 33212-5424</td>
</tr>
<tr>
<td>Bruce R. Rosenblum, MD</td>
<td>Riverview Medical Center 160 Ave. at The Commons Shoreline, WA 98072-4802</td>
</tr>
<tr>
<td>Alan Rosenthal, MD</td>
<td>Winthrop University Hospital 259 First St. Mineola, NY 11542-1101</td>
</tr>
<tr>
<td>Allen S. Rothman, MD, FACS</td>
<td>175 Memorial Hwy. New Rochelle, NY 10801-5640</td>
</tr>
<tr>
<td>Curtis J. Raszal, MD</td>
<td>219 Bryant St. Buffalo, NY 14222</td>
</tr>
<tr>
<td>Catherine A. Ruebenacker-Mazzola, MD</td>
<td>HUMC/Pediatric Neurosurgery 20 Prospect Ave. Ste. 800 Hackensack, NJ 07601</td>
</tr>
<tr>
<td>John R. Ruge, MD</td>
<td>630 S. Oak St Hinsdale, IL 60521-6434</td>
</tr>
<tr>
<td>James T. Rush, MD, PhD, FRC Hospital for Sick Children 555 University Ave. #1904 Toronto, ON M5G-1X8 Canada</td>
<td></td>
</tr>
<tr>
<td>Glenn A. Meyer, MD</td>
<td>Medical College of Wisconsin 9200 W. Wisconsin Ave. Milwaukee, WI 53226-3522</td>
</tr>
<tr>
<td>W. Joel Michelson, MD</td>
<td>108 330 Bortwick Ave. Portsmouth, NH 03801</td>
</tr>
<tr>
<td>Thomas H. Milhorst, MD</td>
<td>North Shore University Hospital 300 Community Dr./NeurosurgeryManhattan, NY 10301</td>
</tr>
<tr>
<td>John E. Miller, MD, FACS</td>
<td>544 E. 86th St., Ste. 6W New York, NY 10028-7536</td>
</tr>
</tbody>
</table>

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AANS/CNS SECTION ON PEDIATRIC NEUROSURGERY

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2004 MEMBERSHIP ROSTER

Steven J. Schneider, MD, FACS
Long Island Neurosurgical Associates
410 Lakeview Rd. Ste. 204
New Hyde Park, NY 11040-1101

Luiz Schuit, 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.
372 SW Sam Jackson Park Rd.
Portland, OR 97239

Wan Tew Seow, MD
WK Women’s & Children’s Hospital
100 Bultin Timms Rd.
Singapore 227999

Ronald F. Shalat, MD
33 Evergreen Dr.
Onida, CA 94563

Kenneth N. Shapiro, MD
Neurosurgeons for Children
1935 Motor St. 3rd Fl
Dallas, TX 75235

John Shillito, MD
1109 Pennaring Post
6 Caswell Sq.
Pittsboro, NC 27312-5014

Howard J. Silberstein, MD
1445 Portland Ave., Ste. 305
Rochester, NY 14621-5008

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

Gary Robert Smonds, MD
6411 Fairway Forest Dr.
Roanoke, VA 24018-1745

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

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

Jodi L. Smith, MD, PhD
Riley Hospital for Children
One Children’s Sq. Ste. 1730
Indiana, IN 46202-5020

Lennwood P. Smith, Jr., MD
Palmetto Neurosurgery & Spine
3 Medical Park Rd. Ste. 310
Columbia, SC 29033-6873

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

Sanideep Sood, MD
Pediatric Neurosurgery Group PC
9091 Beaumont 2nd Fl.
Detroit, MI 48201

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

Phillip G. St. Louis, MD
532 Virginia Dr.
Orlando, FL 32803-1856

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

Paul Sternberg, MD
British Columbia Children’s Hospital
4480 Oak St. Rm. K3-159
Vancouver, BC V6H 3V4

Bruce B. Stons, MD, FACS
7236 Hawthorn N.E.
Albuquerque, NM 87113

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
Ste. 102-118
17602 E. 17th St.
Tustin, CA 92780

Peter P. Sun, MD
Children’s Hospital of Oakland
744 52nd St./Neurosurgery
Oakland, CA 94609-1810

Anthony F. Susen, MD
193 Old Giebe Point Rd.
Burrage, WA 24552-2006

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. Tarkkanen, MD
15 Oakmont Ct.
San Rafael, CA 94901-1235

Todoran Tomita, MD
Children’s Memorial Hospital
2000 Children’s Plaza Ste. 212B
Chicago, IL 60614-3363

Eric R. Trumble, MD
22 Lake Beauty Dr., Ste. 204
Orlando, FL 32806

Gerald F. Tuissi, Jr., MD
880 6th St. S., Ste. 450
St. Petersburg, FL 33701

Niel Tulpen, MD
603 McCory Ln.
Nashville, TN 37221-5905

Michael S. Turner, MD
Indianapolis Neurosurgical Group
1801 N. Senate Blvd. Ste. 535
Indianapolis, IN 46202-1228

David D. Udeh, MD
4390 7th St., Unit E
Moline, IL 61265-6870

Ronald H. Uosmicki, MD
18111 Prince Philip Dr. #110
Olney, MD 20832

Michael Vassulaidy, MD
Children’s Hospital East Ontario
401 Smyth Rd.
Ottawa, ON K1H-8L1

Canada

Joan L. Vennes, MD
1831 North Bend Dr.
Sacramento, CA 95835-1218

Enrique C. Ventura, MD
Children’s Hospital East Ontario
401 Smyth Rd.
Ottawa, ON K1H-8L1

Canada

John Kenric Viey, MD
University of Pittsburgh
217 Victoria Blvd.
Pittsburgh, PA 15261-0001

Steven L. Wold, MD
97 Grove Ln.
Shelburne, VT 05482

John B. Waldron, 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
Tulane University School of Medicine
1430 Tulane Ave. SL47
New Orleans, LA 70112

John D. Ward, MD
Physician College of Virginia
Box 985631 MCV Station
Richmond, VA 23298

Daryl E. Warder, MD, PhD
St. Vincent Hosp./Neurosurgery
835 E. Van Buren St.
Green Bay, WI 54301

Benjamin C. Warf, MD
CURE Children’s Hosp. of Uganda
P.O. Box 903

Mbuale

Uganda

Howard L. Weiner, MD
New York University Medical Center
314 E. 34th St., #1002
New York, NY 10016-4974

Martin H. Weiss, MD, FACS
LAC-USC Medical Center
1200 N. State St., Ste. 5046
Los Angeles, CA 90033-1029

Bradley E. Weprim, MD
Neurosurgeons for Children
1935 Motor St. 3rd Fl.
Dallas, TX 75235-7701

Jean K. Wickenham, MD
3030 Children’s Way, Ste. 402
San Diego, CA 92123-4228

Philip J. A. Willman, MD
5325 Grassmere Dr.
Corpus Christi, TX 78413

Ronald J. Wilson, MD
400 W. 15th St., Ste. 100
Austin, TX 78701

Jewel Winer, MD
York Neurosurgical Associates PC
2319 S. George St.
York, PA 17403-5009

Jeffrey A. Winfield, MD, PhD
1000 E. Gaines Ave., Ste. 602
Syracuse, NY 13210

Kim R. Winston, MD
1556 E. 19th Ave. Box E330
Denver, CO 80218-1007

Jeffrey H. Wissolff, MD
New York University Medical Center
317 E. 34th St., #1002
New York, NY 10016-6402

Daniel Won, MD
11780 Pecan Way
Loma Linda, CA 92354-3452

Shokey Yemada, MD
5410 Via San Jacinto
Riverside, CA 92506

Karlo Zakalk, MD
William Beaumont Hospital
3535 W. 13 Mile Rd. Ste. 104
Royal Oak, MI 48073-6710

Ahmad Zakri, MD
4235 Secor Rd.
Toledo, OH 43623-4231

Edward J. Zampella, MD
Atlantic Neurosurgical Specialists
31 Madison Ave. 2nd Fl.
Morristown, NJ 07960

Luis Manuel Zavala, MD
555 Mowery Ave., Ste. A-B
Fremont, CA 94536-4101

John G. Zovickian, MD
104 Racusa Rd.
Piedmont, CA 94611

NOTES

AANS/CNS SECTION ON PEDIATRIC NEUROLOGICAL SURGERY