Section of Pediatric Neurological Surgeons
of the
American Association of Neurological Surgeons

13th ANNUAL MEETING

Hotel Utah
Salt Lake City, Utah
December 11-13, 1984
PROGRAM SUMMARY

Paolo Raimondi Lecturers, Pediatric Section
Chairmen, Pediatric Annual Meeting Sites
Exhibitors
13th Annual Meeting Scientific Program
13th Annual Meeting Scientific Abstracts
Pediatric Section Member Listing

This program has been approved by the Joint Committee on Education of the American Association of Neurological Surgeons and Congress of Neurological Surgeons for a maximum of 13 hours of Category I credit toward the Continuing Education Award in Neurosurgery.
PAOLO RAIMONDI LECTURERS
E. Bruce Hendrick 1978
Paul C. Bucy 1979
Floyd Gilles 1980
(Panel Discussion) 1981
(Panel Discussion) 1982
Derek Hartwood-Nash 1983
Anthony E. Gallo, Jr. 1984
David G. McLone
(Panel Discussion)

PEDIATRIC SECTION CHAIRMEN
Robert L. McLaurin 1972-73
M. Peter Sayers 1973-74
Frank Anderson 1974-75
Kenneth Shulman 1975-76
E. Bruce Hendrick 1976-77
Frank Nelsen 1977-78
Luis Schut 1978-79
Fred Epstein 1979-81
Joan L. Venea 1981-83
Harold J. Hoffman 1983-

PEDIATRIC ANNUAL MEETING SITES
Cincinnati 1972
Columbus 1973
Los Angeles 1974
Philadelphia 1975
Toronto 1976
Cleveland 1977
Philadelphia 1978
New York 1979
New York 1980
Dallas 1981
San Francisco 1982
Toronto 1983
Salt Lake City 1984

The Pediatric Section of Neurological Surgery of the American Association of Neurological Surgeons gratefully recognizes the support of the following exhibitors for the 1984 Pediatric Annual Meeting:

- Codman & Shurtleff, Inc. — Randolph, Massachusetts
- Cordis Corporation — Miami, Florida
- Medical Measurements, Inc. — Hackensack, New Jersey
- Osstemetric, Inc. — Mountain View, California
- Paulene-Schulte Medical — Santa Barbara, California
- Nicolet Biomedical Instruments — Madison, Wisconsin
- Denver Biomaterials, Inc. — Englewood, Colorado
- Mallinckrodt Laboratories, Inc. — Edmonton, Alberta, Canada

All registrants are encouraged to visit the exhibit area frequently during the meeting.
PROGRAM

PEdiatric SeCTiOn

AMERICAN ASSOCIATION OF NEUROLOGICAL SURGEONS

Hotel Utah
Salt Lake City, Utah

December 11-December 13, 1984

TUESDAY, DECEMBER 11, 1984
6:00-9:00 p.m. Registration—Mezzanine
7:00-9:00 p.m. Reception—Empire Room

WEDNESDAY, DECEMBER 12, 1984
7:00 a.m. Registration—Mezzanine
7:00 a.m. Breakfast—Jade Room
7:45 a.m. Meeting—Lobbyette Ballroom
Opening Remarks
Harold J. Hoffman
7:50 a.m. Welcoming Remarks
M. Peter Holland
Marion L. Walker
8:00 a.m. Annual Paolo Raimondi Lecture

BRAIN TUMORS—Moderators: David G. McLone, Donald Beigel
8:30 a.m. 1. "Long Prognostic Significance of Pediatric Brain Tumors"
Thomas G. Lueisen, Kathy R. Stegel, Roger J. Pecker Leslie N. Sutton, Dennis A. Stroop, Lois Salt
Philadelphia, Pennsylvania
8:45 a.m. 2. "Cerebellar Primitive Neuroectodermal Tumor in Childhood"
Patentis Tomsu, David G. McLone
Chicago, Illinois
9:00 a.m. 3. "Intraventricular Tumors—Treatment with the CO2 Laser"
Walter L. Robinson, Michael Salzman
Baltimore, Maryland
9:15 a.m. 4. "The Feasibility and Advantages of Resecting Midline Intraventricular Gliomas in Children"
A. Leland Albritt, Robert J. Scatton
Pittsburgh, Pennsylvania
9:20 a.m. 5. "Brain Stem Tumors: A Reappraisal"
Fred Epstein, Lawrence L. McCreery
New York, New York
9:30 a.m. 6. "The Microscopic Mediastinal Juvenile Angiomyxoma: A Histological Study"
Stuart Goodman, Marion L. Walker, J. Townsend, Bruce B. Stovin, W.M. Gooch
Salt Lake City, Utah
9:40 a.m. Panel Discussion—Papers 3-6
10:00 a.m. COFFEE BREAK—Mezzanine

BRAIN TUMORS—Moderators: Harold J. Hoffman, Kenneth Shapiro
10:30 a.m. 7. "A Review of 20 Children Treated for Medulloblastomas"
Mark O'Brien, Daniel L. Board, Robert B. Tapper
Atlanta, Georgia
10:45 a.m. 8. "Management of Subependymal Giant Cell Astrocytomas"
Robert A. Sardan
Jackson, Mississippi

11:00 a.m. 9. "Oligodendroglia Associated with Radiotherapy: Review of 4 Cases"
Thomas S. Biers, Bolleslaw H. Laveza
Cincinnati, Ohio
11:15 a.m. 10. "Preliminary Experience with 125-Iodine Brachytherapy in Children"
Michael S. B. Edwards, Philip H. Grün, Steven Leib, Sharon Lamb
San Francisco, California
11:30 a.m. 11. "Dumb-bell Neuroblastoma in Children: Review and Treatment"
Edward J. Kozlak, Martin P. Sayres
Columbus, Ohio
11:45 a.m. 12. "Pituitary Hyperplasia Due to Hypothyroidism"
Leslie N. Sutton, Thomas Moshang, Leifdi Blintnik, Lewis Samuel
Philadelphia, Pennsylvania
12:00 noon LUNCH—Empire Room

CD3M—Moderators: Michael Edwards, Gordon McComb
1:15 p.m. 13. "Morphological Study of Preepithelial Encephalolocye Using 3-Dimensional Reconstruction of Computed Tomography"
David C. Hermsen, David J. David, Donald A. Simpson
Milwaukee, Wisconsin/Adele, South Australia
1:30 p.m. 14. "Oblique View of Basal Cerebri in CT: The Cardinal Sign of Life-Threatening Shunt Failure"
Dennis L. Johnson, Charles Piz, David C. McColough
Washington, D.C.
1:45 p.m. 15. "Ultrasound Anatomy of the Posterior fossa: Anatomic—Sonographic Correlations"
Thomas P. Muzahl, David W. Wedeloh
Chicago, Illinois
2:00 p.m. 16. "The Canine Cardiovascular and Cardiovascular Function in Children: A Prospective Evaluation of Multimodal Imaging Techniques"
Sharon S. Monastery, Wendy R. Smoker, Linda Cottrell
Iowa City, Iowa
2:15 p.m. 17. "Magnetic Resonance Imaging in Spinal Dysraphism"
Lori L. Whelen, Alice M. Allen, Michael D. Delitto, James Printz
Ann Arbor, Michigan
2:20 p.m. 18. "Surgical Comerlites of Nuclear Magnetic Resonance (NMRI)"
Nath Moudrain, Joseph F. Hahn, Michael T. Modic, Meredith Weinstein
Cleveland, Ohio
3:00 p.m. Panel Discussion—Papers 16-19
3:00 p.m. COFFEE BREAK—Mezzanine

DEVELOPMENTAL ANOMALIES—Moderators: Denis Bruce, Joan Varas
3:30 p.m. 19. "The Type I Chiari Malformation in Childhood and Adolescence"
W. Jerry Oakes
Durham, North Carolina
3:45 p.m. 20. "Total Heart Failure Investigation of Chiari I Malformation in Infants"
Bruce B. Stovin, Marion L. Walker
Salt Lake City, Utah
4:00 p.m. 21. "Dermatomal Tumors at the Site of Previous Myelomeningocele Repair"
R. Michael Scott, Louis Berhockey, Samuel M. Wijsman, Sherrill Zimber, George Kiierner
Boston, Massachusetts
4:15 p.m. 22. "Progressive Caudal Equinum Syndrome in Children with the Caudal Endodermal Syndrome"
Ardin F. Reynolds, Michael Polyb, Patrick Bernes, A. Sullivan, E. Smith, W. Tonnell, W. Barnes, P. Laster
Oklahoma City, Oklahoma
4:30 p.m.  23. “Amin of Galen Aneurysm: Combined Treatment by Embolisation and Surgery”  Jeffrey H. Winoff, Alejandro Berenstein, Fred J. Epstein  New York, New York


4:50 p.m.  25. “Cerebrovascular Malformations in Children: A Retrospective Analysis of 28 Cases”  Francisco A. Gutierrez, David G. McLone, Thomas P. Naidech  Chicago, Illinois

5:00 p.m.  Discussion of Papers 23-25

5:15 p.m.  Annual Business Meeting—Members Only

7:00 p.m.  Reception—Salt Lake Art Center

8:00 p.m.  Annual Banquet—Salt Lake Art Center

THURSDAY, DECEMBER 13, 1984

7:00 a.m.  Breakfast—Jade Room

HYDROCEPHALUS—Moderators: William Cheek, Fred Epstein

8:00 a.m.  26. “A Laboratory Model of Stent Dependent Hydrocephalus”  Ann Frod, Kenneth Shapiro  Bronx, New York

8:10 a.m.  27. “An Experimental Model Showing Why the Subarachnoid Decompression Should Work in the St Vitus Syndrome With Some Suggestions As To Why It Doesn't Work Often Enough”  Kenneth Shapiro, Futoshi Takeda  Bronx, New York

8:20 a.m.  Discussion of Papers 26-27

8:30 a.m.  28. “Management of Expanding Multiple Loculated CSF Filled Cisterns Following Enteric Organism Ventriculitis”  Robert Breeze, J. Gordon McComb  Los Angeles, California

8:40 a.m.  29. “Loculated Ventricles—Aren't’  David G. McLone, Thomas P. Naidech  Chicago, Illinois

8:50 a.m.  Discussion of Papers 28-29

9:00 a.m.  30. “Ventriculo-peritoneal Shunts in the High-Risk Newborn Under 2,000 Grams of Weight—Clinical Report”  Hector E. James, R. Bejar, L. Gluck, R. Coen, A. Merritt, F. Marrero, P. Bomberger, B. Saunders, R. Schneider  San Diego, California


9:40 a.m.  33. “Use of BAER in the Management of Neonatal Hydrocephalus”  Meredith Olds, Bruce B. Stern, Marion L. Walker  Michael J. Coevert, Nanette Newberg  Salt Lake City, Utah

9:50 a.m.  Discussion of Papers 30-33

10:00 a.m.  COFFEE BREAK—Mezzanine

View Exhibits—Jr. Ballroom

HYDROCEPHALUS—Moderators: Robin Humphreys, Mark O'Brien

10:30 a.m.  34. “One Year Followup of the Prospective Randomized Double Blind Trial of Antibiotic Prophylaxis in Cerebrospinal Fluid Shunt Infection”  Mel H. Epstein, R. Kumar, P. Liebrand, W. Hughes  Baltimore, Maryland

10:40 a.m.  35. “Decreased Risk of Infection in Cerebrospinal Fluid Shunt Surgery Using Prophylactic Antibiotics: A Case-Control Study”  Beverly C. Walters, Harold J. Hoffman, E. Bruce Hendrick, Robin P. Humphreys  Toronto, Ontario, Canada

10:50 a.m.  Discussion of Papers 34-35

11:00 a.m.  36. “Contribution of the Spinal Compartment to Cerebrospinal Fluid Drainage”  J. Gordon McComb, Shigeo Hyman, Martin H. Weiss  Los Angeles, California

11:15 a.m.  37. “The Pathophysiology of IVH in the Beagle Puppy”  Dennis L. Johnson, Catherine Shear, David C. McCullough  Washington, D.C.

11:30 a.m.  38. “In Vivo Evaluation of CSF Shunt Function by Radiouclide Cerebrospinal Studies”  Bruce D. Pendleton, P. Alex Roberts, Arden F. Reynolds, Michael Poley  Oklahoma City, Oklahoma

11:45 a.m.  39. “Abdominal CSF Cyst Syndrome: Diagnosis and Management”  Yoan S. Hahn, Herbert H. Englehard  Chicago, Illinois

12:00 noon  LUNCHE—Empire Room

Brain Tumor Study Group Report

Moderators: Harold Rehfeld, Leroy Page

1:00 p.m.  40. “Moja Moys: Experience at the Hospital for Sick Children”  Meredith V. Olds, Harold J. Hoffman  Toronto, Ontario, Canada

1:15 p.m.  41. “Extreme Hyperventilation and Cerebral Bioenergetics in the Cat”  Patricia Gribbins, David Swadel, Frank Walsh, Darrell A. Bruce  Philadelphia, Pennsylvania

1:30 p.m.  42. “Operative Planning For Congenital Cerebral Malformations and Hydrocephalus: Benefit of Stable Xenon Computed Tomography”  Ria H. Maruwat, T. J. Service, John Horey, Hal W. Pfitzen  Phoenix, Arizona

1:45 p.m.  43. “Temporal Lobectomy in Children with Epilepsy”  W. Richard Mershel, Frederic B. Roberts, Edward R. Lawson, Frank W. Shaubroom  Rochester, Minnesota

2:00 p.m.  44. “Spontaneous Epidural Cerebro-Thoracic Hematoma Extending From C-3 to T3 in a Child”  Joan H. Humphreys, John P. Laurent, William R. Cheek, Hesten Megdall  Houston, Texas
2:15 p.m.  45. "Selective Posterior Rhizotomy for the Relief of Spasticity"
           W. J. Peacock
           Cape Town, South Africa

2:30 p.m.  46. "Intercerebral Arachnoid Cysts in Children"
           G. R. Harsh, Michael S. B. Edwards, Charles E. Wilson
           San Francisco, California

2:45 p.m.  47. "The Manifestations and Management of Hydroxyapatite in
           Childhood"
           John Neil, Harold J. Hoffman, E. Bruce Hendrick, Robin P. Humphreys
           Toronto, Ontario, Canada

3:00 p.m.  COFFEE BREAK — Mezzanine

3:30 p.m.  48. "Occipital Plagiocephaly Due to Unilateral Lamboid Synostosis —
           A Reappraisal and Some New Thoughts"
           Clinton F. Miller, John W. Skinner, Joseph M. Nadel
           New Orleans, Louisiana

3:45 p.m.  49. "Terminal Myelocystecele"
           Thomas F. Nautsch, David G. McLone
           Chicago, Illinois

4:00 p.m.  50. "Increase in Ventricular Size with High Pressure Infusion of Artificial
           CSF into the Lateral Ventricles of Dogs"
           Harold L. Rokut, Scott Erinow, Howard Chizeck
           Cleveland, Ohio

4:15 p.m.  51. "Hydrocephalus: Symptomatic Low ICP and Asymptomatic High
           Intracranial Pressure Syndromes Treated by Flo-Control Valve Shunting"
           Eldon L. Bult, Jeffrey Barresi
           Orange, California

4:30 p.m.  52. "Cranialtical Techniques in Pediatric Neurosurgery"
           Larry V. Cameron
           Augusta, Georgia

4:45 p.m.  53. "Modified Prewar Position and Cross-Barrier Craniosynostosis For Total Cranial
           Vault Reconstruction"
           T. S. Park, Charles S. Haworth, M. Sean Grady, John A. Jane
           Charlottesville, Virginia

7:00 p.m.  Mormon Tabernacle Choir Rehearsal

SECTION OF PEDIATRIC NEUROLOGICAL SURGERY

MEMBERS

A. Leland Albright, M.D.
Children's Hospital of Pittsburgh
Pittsburgh, PA 15213

Eben Alexander, Jr., M.D.
Bowman Gray School of Medicine
Winston-Salem, NC 27103
919/748-4082

A. Loren Amaacher, M.D.
85 Jefferson St.
Hartford, CT 06106

Frank M. Anderson, M.D.
2101 Redwood St., Ste. 305
Los Angeles, CA 90036
213/691-2845

Weber L. Bailey, M.D.
8032 Hidden Bay Blvd.
Lake Elmo, MN 55042

Donald Paul Becker, M.D.
Medical College of Virginia
Box 508, MCV Station
Richmond, VA 23298

Thomas S. Berger, M.D.
505 Oak St.
Cincinnati, OH 45219
513/221-1100

Edgar A. Bunting, Jr., M.D.
Creek House
Oxford, MD 21654

Derek B. Bruce, M.D.
Division of Neurosurgery
34th St. and Civic Center Blvd.
Philadelphia, PA 19104
215/596-6369

William A. Rechtshaff, M.D.
Temple University Health Center
3401 N. Broad St.
Philadelphia, PA 19140

Peter V. Carmel, M.D.
Neurological Institute
710 W. 16th St.
New York, NY 10032
212/694-5208

William R. Cheek, M.D.
Texas Children's Hospital
7000 Fannin St.
Houston, TX 77030
713/799-9632

Richard A. Costlow, Jr., M.D.
311 Middlebury Dr.
River Ridge, LA 70123
504/436-1659

Robert M. Cosby, M.D.
1205 York Rd.
Lutherville, MD 21093
301/923-1300

Michael Dorsen, M.D.
711 E. 39th St
Building B, STE B-4 A
Austin, TX 78705

Charles C. Duncam, M.D.
Wile University School of Medicine
Neurology Section
New Haven, CT 06511
203/785-2809

Michael S. B. Edwards, M.D.
University of California
Dept. of Neurosurgery, 798M
San Francisco, CA 94143
415/666-1037

Howard M. Eisenberg, M.D.
University of Texas Medical Branch, Division of Neuro.
Galveston, TX 77550

Arthur B. Eisenberg, M.D.
1025-26 Fisher Bldg.
Detroit, MI 48202
313/973-6590

Fred J. Epstein, M.D.
New York University Medical Center
550 First Ave.
New York, NY 10016

Mel H. Epstein, M.D.
Johns Hopkins Hospital
Baltimore, MD 21205

Edward G. Fischer, M.D.
Children's Hospital Medical Center
Boston, MA 02115

Edith L. Politz, M.D.
University of California at Irvine
Medical Center
101 City Dr. S
Orange, CA 92668
Joseph Nofel, M.D.
Children’s Hospital
200 Henry Clay Ave.
New Orleans, LA 70118
504/869-0575

Hiro Nishihata, M.D.
704 S. Webster Ave.
Green Bay, WI 54301

G. Robert Nugent, M.D.
W VA University Medical Center
Dir of Neuro
Morgantown, WV 26506

Frank B. Nugent, M.D.
University Hospital
2074 Abington Rd.
Cleveland, OH 44106

Mark Stephen O’Brien, M.D.
Emory University Clinic
1365 Clifton Rd, NE
Atlanta, GA 30322

W. Jerry Osbeck, M.D.
1525 Sycamore St.
Durham, NC 27707
919/684-5013

Larry Keith Page, M.D.
University of Miami
School of Medicine
P.O. Box 016950
Miami, Fl 33101

Dwight Parker, M.D.
1111-1125 Bannanay Ave.
Winston-Salem, NC 27103

Jerry O. Penix, M.D.
607 Medical Tower
Norfolk, VA 23507
804/322-5325

Byron C. Perrewee, M.D.
2340 Clay St., Ste. 402
San Francisco, CA 94115
415/563-4497

Hal W. Pettiford, M.D.
Barnes Neurological Institute
302 W. Thomas Rd.
Phoenix, AZ 85013
602/264-7081

Frederick W. Pitts, M.D.
1245 Wilshire Blvd., Ste. 305
Los Angeles, CA 90017
213/977-1102

Harold D. Portory, M.D.
1431 Woodstock Ave.
Bloomfield Hills, MI 48013
313/334-2960

Robert H. Pufaz, M.D.
Rm. 1, Box 79
Pittsfield, MA 01201
312/944-3370

Joseph Reznikoff, M.D.
New York University Medical Center
550 First Ave.
New York, NY 10016

Donald H. Reed, M.D.
4815 Liberty Ave.
Pittsburgh, PA 15224

Harold Louis Reuben, M.D.
University Hospital
2074 Abington Rd.
Cleveland, OH 44106

Alden Paine Reynolds, Jr.
University of Oklahoma, Neurosurgery
P.O. Box 26307
Oklahoma City, OK 73126

Albert L. Rhoton, Jr., M.D.
University of Florida Health
Box 2063, Dept. of Neurosurgery
Gainesville, FL 32610

Walter Lee Robinson, M.D. (Mae Meads)
1205 West Rd.
Lutherville, MD 21093
301/283-1300

James H. Salvino, M.D. (Louisa)
Medical Arts Bldg.
225 W. 25th St., Ste. 305
Erie, PA 16502
814/453-5380

Morris Sanders, M.D. (Jeanne)
5969 Harry Hines Blvd.
Ste. 620
Dallas, TX 75225
214/837-0420

Robert A. Sandor, M.D. (Elinore)
University of Mississippi Medical Center
Jackson, MS 39216
601/987-5661

Martin Peter Sayers, M.D.
2860 Carnegie Rd.
Columbia, SC 29206
803/767-4692

Timothy R. Scarff, M.D.
Loyola University Medical Center
2100 S. First Ave.
Maywood, IL 60153

Louis Schott, M.D.
34th & Civic Center Blvd.
Philadelphia, PA 19104
215/595-5556

R. Michael Scott, M.D.
New England Medical Center
Boston, MA 02111
617/956-5568

Robert G. Selekman, M.D.
Montefiore Hospital
3459 5th Ave.
New York, NY 10037

Ronald F. Shearman, M.D.
3500 Old
Berkeley, CA 94705
415/434-2681

Kenneth Slapchinsky, M.D.
44 Maybank Ave.
Larchmont, NY 10538
914/634-8377

John Shilling, M.D.
300 Longwood Ave.
Boston, MA 02115

James C. H. Simmon, M.D.
920 Madison Ave., Ste. 201
Memphis, TN 38103

Frederick Herman Sklar, M.D.
8226 Douglas Ave.
Dallas, TX 75225

Frank P. Smith, M.D.
460 Cass St.
Monterey, CA 93940

Sherman Charles Stein, M.D.
127 Rehn Hills Dr.
Longmeadow, MA 01066

Paul Stensby, M.D.
700 W. 10th Ave., Ste. 300, C Floor
Vancouver, BC V5Z 4E5
604/679-1115

James Stantos, M.D.
1221 Madison, Ste. 1118
Seattle, WA 98104

Michael Sobol, M.D.
801 N. Tamtin, Ste. 406
Santa Ana, CA 92705

Anthony R. Sosey, M.D.
3600 Forbes Ave.
Pittsburgh, PA 15213

Michael S. Taskman
3000 Colby
Berkeley, CA 94705
415/434-2681

John M. Taw, Jr., M.D.
506 Oak St.
Cincinnati, OH 45219

Joan Venet, M.D.
University of Michigan Medical Center
C-5070 Outpatient Bldg.
Ann Arbor, MI 48109

Ezequiel Carlos Garcia Ventura
401 Smyth Rd.
Otawa, ON K1H 8E1

John Kenzie Wiles, M.D.
Child Hospital of Pittsburgh
125 Desoto St
Pittsburgh, PA 15213

Marion "Jack" L. Wilkner, M.D.
320 12th Ave.
Pittsburgh Children’s Hospital
Salt Lake City, UT 84103
801/521-1250

John Wilson Walsh, M.D.
University of Kentucky Medical Center
300 E. University, Dept. of Neurosurgery
Lexington, KY 40506

Thomas A.Welz, M.D.
Skep Corporation and Research Foundation
10966 N. Torrey Pines Rd.
La Jolla, CA 92037
619/457-5925

John D. Ward, M.D.
Medical College of Virginia
Richmond, VA 23223
804/796-9659

Martin H. Weiss, M.D.
357 Georgiades Rd.
Flintshire, CA 90111
1. LONG PRODRAL PRESENTATIONS OF PEDIATRIC BRAIN TUMORS

W. Keaney Walsh, M.D.
Children’s Hospital Medical Center
300 Longwood Ave.
Boston, MA 02115
617/735-6008

Robert Joseph White, M.D.
Metropolitan General Hospital
3365 Scotten Rd.
Cleveland, OH 44109

Ken Rose Whiston, M.D.
300 Longwood Ave.
Boston, MA 02115

Naked Yamada, M.D.
Loma Linda University School of Medicine
Section of Neurosurgery
Loma Linda, CA 92354

Fourteen children were presented who fulfilled the following criteria: 1) onset of neurological disturbances early in childhood. 2) Normal or non-diagnostic neurodiagnostic studies at the time of initial presentation. 3) The subsequent demonstration of CNS neoplasms after an interval of greater than 2 years. Three general initial presentations were found: 1) Obstructive hydrocephalus (6 children), with the onset at an average age of 5 years. All of these children were subsequently shown to harbor postoperative fossa tumors after an average interval of 6 years. 2) Epilepsy (6 children) with the average age of onset being 5.2 years. All of these children were subsequently found to harbor hemispheric tumors after an average interval of 6.2 years. 3) Neuro-psychiatric presentations (4 children), such as “Learning Disabilities”, “Cerebral Palsy”, or “Psychogenic Vomiting”. The average age of initial presentation was 1.5 years; the average interval until tumor diagnosis was 5.5 years. These findings suggest that a small percentage of children with CNS neoplasms can present initially as a more common pediatric neurological syndrome and carry that diagnosis for prolonged periods. Thus, a high index of suspicion is required in order to correctly diagnose the underlying problem, so that definitive treatment can be undertaken at the earliest opportunity.

2. CEREBRAL PRIMITIVE NEUROTODERMAL TUMOR IN CHILDHOOD

Tadanori Tonita, M.D., David Golden, M.D., Ph.D. (Chicago, IL)

Ten patients with cerebral primitive neuroectodermal tumors (PNFT) were treated from 1979 through 1983. There were 5 males and 5 females and age ranged from 22 months to 13 years. All were diagnosed by computed tomography (CT) and angiography which indicated a large partially cystic, calcified mass with a variety of vascularity. Nine patients underwent craniotomy with gross total resection in 4, partial resection in 4 and biopsy alone in 1. One patient required only CBF diversion shunt and whole radiation therapy and autopsy confirmed cerebral PNFT. All except one patient who died 4 days after partial resection of the tumor received radiation (5018-5500 rads over whole brain plus focal boost with 1090 rads in one, and plus additional spinal radiation 2516 rads in 1). Despite one post-operative death, 6 patients died of tumor 6 to 25 months after diagnosis. Three patients are alive with tumor control over 18 to 36 months. Two of these received intercavitary injection of methotrexate and cisplatin with disappearance of tumor on CT.

Current concept of PNFT and management of the patients with PNFT will be discussed.
3. INTRAVENTRICULAR TUMORS—TREATMENT WITH THE CO₂ LASER

Walker L. Robinson, M.D., Michael Salzman, M.D. (Lutherville, MD)

The CO₂ laser has proven to be a valuable surgical adjunct in the treatment of intracranial and intraventricular tumors. In intracranial lesions, the laser's unique qualities have proven especially useful in lesions deep to eloquent cortex, basal meningiomas, and intraventricular tumors.

Over the past 36 months, 472 tumors were resected in our clinic with 144 of the cases being carried out utilizing the laser (30.5%). Intraventricular lesions were encountered in 21 (14.5%) of the laser cases. The 21 cases were distributed as follows:

- Sex: 15 males/6 females
- Pathology: Medulloblastomas -1
- Astrocytomas (28, 1/12) -4
- Choroid Plexus Papilloma-4
- Hemanangioblastoma -1
- Location: 4th Ventricle -11
- Lateral Ventricle -1
- 3rd Ventricle -1

Our operative results show no mortality, a 4.4% (1/23) morbidity rate (an epidural hematoma after ventricular decompression), gross total resections in 58% (15/26), near total resections in 14% (3/21), and no recurrences to date (1 year minimum follow-up).

The surgical techniques necessary to allow successful resection of intraventricular lesions include:
- Variations in spot size and wattage.
- Commissurotomy of the two-point suction cautery (Scarff/Greenberg) to clear blood and vapor, remove char, and to use parallel large blood vessels.
- Clamped and retracted retractor blades to prevent reflection of the beam and inadvertent damage to adjacent tissues.
- Extensive use of constantly moistened cottonoids to protect adjacent brain and to cover reflective retractor blades.

The CO₂ laser provides the surgeon with a delicacy of dissection, a major reduction in tissue manipulation, and the ability to remove distant lesions not afforded by any other surgical adjunct. The benefits, unfortunately, are not without limitations. Operating time is increased; surgery is tedious when dealing with large lesions and hemorrhage is poor when large blood vessels are encountered.

4. THE FEASIBILITY AND ADVIABILITY OF RESECTION MALIGNANT INTRAVENTRICULAR GROWTHS IN CHILDREN

A.landing Albritton, M.D., Robert J. Schrott, M.D. (Philadelphia, PA)

Children with midline intraventricular gliomas in the optic chiasm, 3rd ventricle, brainstem, and cerebellum are often treated by radiotherapy without a tissue diagnosis. If tissue is obtained, it is usually obtained by a limited biopsy, with either open or stereotactic. Two recent technological advances—the CO₂ and SCU lasers—have enabled neurosurgeons to remove tumors with less morbidity than previously. During the past two years we have used the CO₂ and SCU lasers to resect midline intraventricular gliomas in ten children. The feasibility results and the indications for such operations are the basis for this report.

Clinical information of the ten children is presented in the table:

<table>
<thead>
<tr>
<th>Age, Yrs</th>
<th>Tumor Site</th>
<th>Diagnosis</th>
<th>% Resection</th>
<th>Postoperative Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>Chiasm</td>
<td>Astrocytoma</td>
<td>60%</td>
<td>VEP No deficit</td>
</tr>
<tr>
<td>0.9</td>
<td>Chiasm</td>
<td>Astrocytoma</td>
<td>90%</td>
<td>VEP No deficit</td>
</tr>
<tr>
<td>1.5</td>
<td>Thalamus</td>
<td>Glioblastoma</td>
<td>50%</td>
<td>EEG Deficit</td>
</tr>
<tr>
<td>2.1</td>
<td>Thalamus</td>
<td>Astrocytoma</td>
<td>75%</td>
<td>EEG Deficit</td>
</tr>
<tr>
<td>2.2</td>
<td>Thalamus</td>
<td>Glioblastoma</td>
<td>75%</td>
<td>EEG Deficit</td>
</tr>
<tr>
<td>2.9</td>
<td>Thalamus</td>
<td>Glioblastoma</td>
<td>75%</td>
<td>EEG Deficit</td>
</tr>
<tr>
<td>3.1</td>
<td>Midbrain</td>
<td>Astrocytoma</td>
<td>55%</td>
<td>EEG Deficit</td>
</tr>
<tr>
<td>3.8</td>
<td>Pons</td>
<td>Glioblastoma</td>
<td>75%</td>
<td>EEG Deficit</td>
</tr>
<tr>
<td>4.1</td>
<td>Pons</td>
<td>Glioblastoma</td>
<td>50%</td>
<td>EEG Deficit</td>
</tr>
<tr>
<td>4.5</td>
<td>Pons</td>
<td>Astrocytoma</td>
<td>80%</td>
<td>EEG Deficit</td>
</tr>
</tbody>
</table>

The extent of tumor resection was documented by CT scans which will be shown. No patient had a serious postoperative neurologic deficit if enough tissue was resected and if the patients were monitored intra-operatively and were unchanged by the resection. Cases demonstrating that extensive resections can be done on enhancing midline intraventricular tumors with less morbidity, with serious, but probably acceptable, morbidity if enough potential is monitored.

The advisability of such operations certainly cannot be determined from these patients. The strongest evidence supporting such resections comes from a recent Children's Hospital Study Group study of children with astrocytomas of grades II, III, IV (CCSG-243), which concluded that the extent of resection is significantly associated with the length of survival: children with total resection survive longer than those with partial resections, and those with partial resections survive longer than those who are only biopsied.

5. BRAIN STEM TUMORS—A REVIEW

Fred Epstein, M.D., Robert Larry Mcclussy, M.D. (New York, N.Y.)

We present our preliminary experience with a new approach to children with brain stem tumors. This was accomplished by the fact that the dismal outlook for these children has remained unchanged for 20 years. Because the therapeutic options available for children with brain stem lesions are similar, we felt justified in applying our experience with spinal cord tumors to include brain stem lesions. We have utilized technological advances including the operating microscope, electron, ultrasonic aspirator, laser, and brain stem analysis to make this feasible.

Prior to this we had operated on approximately 100 children with benign spinal cord astrocytomas, many of whom have returned to normal, active lifestyles. Only long term follow-up will allow us to document prolonged efficacy.

It has been our experience that operation changed neither the biology nor the clinical course of malignant brain stem tumors.

We observed that 8% of the tumors at or above the pons made level were malignant and roughly this same percentage of the lower brain stem were benign. In the latter group we included tumors that fell into Hoffmann's category of ependymal fourth ventricular tumors, acting most often like the supratentorial tumor without diffuse brain stem infiltration. The postoperative mortality was seen in 80% of malignant tumors and 40% of low grade tumors. Tumors at or above the pons, however, carried a much higher rate of survival.

We are currently advocating operative resection for localized lower brain stem neoplasms. Utilizing this approach we have noted frequently quite satisfying results of long tract and certain cranial nerves. We have also experienced amelioration of some chronic pain problems and improvement in nausea, vomiting and dysphagia.
8. MANAGEMENT OF SUBEPICRANIAL GIANT CELL ASTROCYTOMA

Robert A. Sanford, M.D. (Jackson, Miss.)

Seven cases of subependymal giant cell astrocytomas in patients with tuberous sclerosis have been managed at the University of Mississippi Children's Hospital since the advent of CAT scanning.

These tumors are characteristically located at the foramen of Monro, producing obstructive hydrocephalus as they progressively enlarge. Four of the children required bilateral CSP diversionary procedures to treat their hydrocephalus. Three children underwent surgical removal of a subependymal giant cell astrocytoma to control the increased intracranial pressure produced by the tumor mass.

This progressive growth of the subependymal giant cell tumor is contrasted with the multiple subependymal nodules of the ventricular wall which calcify but do not enlarge. The characteristic location of the tumor at the head of the caudate nucleus and progression differentiates the astrocytomas from the more benign tubers.

Our seven cases demonstrated a deliberate rate of growth. Progression of seizures, mental retardation, systemic involvement and neurologic impairment is unpredictable in the child with tuberous sclerosis. The predictably slow rate of tumor growth allows the surgeon to delay surgery until absolutely necessary.

The presentation outlines our surgical approach and compares the results with the 26 cases reported in the English literature.


9. GLIOMAS ASSOCIATED WITH RADIOTHERAPY: REVIEW OF FOUR CASES

Thomas S. Berger, M.D., Boleslaw H. Lwizkis, M.D. Ph.D. (Cincinnati, Ohio)

Irradiation associated intracranial tumors are uncommon. Among these tumors, sarcomas are most often encountered and, until 1963, only 18 cases of gliomas were reported. During the past seven years, we have encountered five cases, of which two were irradiated in childhood. All of our pediatric cases were males, and there was a 5 to 25 year latency period between radiotherapy and the diagnosis of gliomas in our five cases. All were anaplastic and one was of non-epidermoid origin. Diagnosis was based on tissue biopsy. Eighty percent of our cases were high grade gliomas, which is unusual for this age group.

The cases are summarized in the table:

<table>
<thead>
<tr>
<th>First Tumor Diagnosis</th>
<th>Age</th>
<th>Radiation Dose (cGy)</th>
<th>Second Tumor Diagnosis</th>
<th>Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astroblastoma</td>
<td>7 yrs</td>
<td>5500</td>
<td>Glioblastoma</td>
<td>13 yrs</td>
</tr>
<tr>
<td>Embryonalcarcinoma</td>
<td>7 yrs</td>
<td>5500</td>
<td>Glioblastoma</td>
<td>13 yrs</td>
</tr>
<tr>
<td>Ependymoblastoma</td>
<td>5 yrs</td>
<td>1800</td>
<td>Anaplastic</td>
<td>5 yrs</td>
</tr>
<tr>
<td>Ependymal Astrocytoma</td>
<td>5 yrs</td>
<td>5500</td>
<td>Glioblastoma</td>
<td>13 yrs</td>
</tr>
<tr>
<td>Choroid plexus</td>
<td>12 yrs</td>
<td>5500</td>
<td>Glioblastoma</td>
<td>13 yrs</td>
</tr>
</tbody>
</table>
12. PITUITARY HYPERPLASIA DUE TO PRIMARY HYPOPHYRIDISM
Leisl U. Sutten, M.D., Thomas Nwosu, M.D., Larissa Silinuk, M.D.,
Lewis Samuel, M.D., (Philadelphia, Pa.)
Primary hypothyroidism can result in reactive enlargement of the pituitary gland, which on CT scan is indistinguishable from primary pituitary lesions. Two teenage girls and 1 adult were presented in whom enhancing masses in the pituitary region were found on CT scan, and in whom surgery was averted by endocrinologic testing and follow-up CT scans after the administration of thyroid replacement. In retrospect, the CT findings are characteristic showing a brilliantly enhancing cone-shaped intra- and suprasellar mass on the coronal view. The importance of the pre-operative endocrinologic evaluation in these patients is stressed.

13. MORPHOLOGICAL STUDY OF FRONTALIS ENCEPHALOCLES USING 3-DIMENSIONAL RECONSTRUCTION OF COMPUTED TOMOGRAPHY
David C. Nunnery, M.D., David J. David, P.R.A.C.S., Donald A. Simpson, P.R.A.C.S.
(Milwaukee, Wl.)
12 children ranging from 1.5 to 14.2 years of age were included in this study. 10 patients were males and 2 were female. Indications cases with true fronto- nasal encephalocles were included. Cases with craniofacial clefts and related craniofacial anomalies were excluded. One half of the patients had neurosurgery in early life in Malaysia. Procedures performed included simple trans-section of the neck of the encephalocele and repair of the dura in 4 cases and shunting for hydrocephalus in 2. The radiologic investigation provided the most pertinent diagnostic information particularly through the use of 3-dimensional reconstruction of computed tomography. The endonasal route was employed in all cases. The 3-dimensional reconstruction of the frontal encephalocele revealed the bony deformity of the facial region fitted into the 3 categories described by Swanson. In the nasofrontal type the skull defect was noted to be at the root of the nose displacing the nasal bones inferiorly. In the nasoethmoi-dal type the nasal bones remained contiguous with the frontal bone and the encephalocele exited between the normal nasal bones and the nasal cartilage and septum. Lastly, in the nasoethmoidal type the frontal and nasal bones were contiguous with some depression of the nasal bones inferiorly. In the nasoethmoi-dal type the nasal bones remained contiguous with the frontal bone and the encephalocele exited between the normal nasal bones and the nasal cartilage and septum. In the nasoethmoidal type the nasal bones were contiguous with some depression of the nasal bones inferiorly. In the nasoethmoi-dal type the nasal bones remained contiguous with the frontal bone and the encephalocele exited between the normal nasal bones and the nasal cartilage and septum.
14. OBSTRUCTION OF CEREBRAL CISTERNS ON CT, THE CARDINAL SIGN OF LIFE-THREATENING SHUNT FAILURE

Dexter T. Johnson, M.D., Charles Fitz, M.D., David C. McCulloch, M.D.
(Washington, D.C.)

Although it is rare that a child dies from shunt malfunction, every experienced pediatric neurosurgeon is aware of patients who precipitously deteriorated on the ward while awaiting intervention for their already existing scheduled surgery. We are presenting 8 cases of shunt malfunction who were referred on admission review for possible admission following day. A precipitous decline in neurologic status prompted unclassified, emergency shunt replacement in each case. In fact of the 8 patients demonstrated decerebrate posturing just prior to surgery; 3 patients had a cardiopulmonary arrest; and 2 of the patients died. Clinical history did not suggest the presence of shunt dependence. Most children had been revised several times before and never under urgent circumstances. Most of the older children had headaches for 5 days or more, and a majority had been vomiting for more than 24 hours. Furthermore, there were no physical signs which suggested surgical malfunction. In patient had papilledema and only 2 children had new eye signs; no papillary changes were manifest. Review of the CT scans revealed ventriculomegaly with previously documented smaller ventricles. More importantly, the basal cisterns were not seen on any previous scan but were visible postoperatively in the cases which survived. To weigh the importance of this observation we reviewed the histories and CT scans of 50 cases of hydrocephalus randomly taken from the neuroradiology files. Obstruction of the basal cisterns proved to be a reliable radiographic sign of shunt malfunction which required emergent attention.

15. ULTRASOUND ANATOMY OF THE POSTERIOR Fossa, ANALYSIS AND CORRELATIONS

Thomas P. Neulich, M.D., David Tussoroschen, M.D.
(Chicago, Ill.)

Correlation of advanced, computer-aided sonograms (Acuson®) with fresh and myelin-stained brain sections documents that sonographically displays the cerebral peduncles, substantia nigra, aqueduct and colliculi of midbrain in anterior-posterior, and on oblique sections. The ventricles routinely display the bony and curvilinear walls of posterior fossa, the ecchocardiograms basal sagittal, coronal, and sagittal sections. The postero-inferior aspect of the pons, the pontomesencephalic sulci, the medullary including olive, the individual leaflets of the dentate, the middle cerebellar peduncles and the cerebellar hemispheres. The authors illustrate the sonograms, correlate them with brain sections, and demonstrate their use for the diagnostic neuropathology.

16. IMAGING THE CEREBELLUM: A CEREBRAL NEUROEPITHELIAL TUMOR IN CHILDREN: A PERSPECTIVE EVALUATION OF MULTIPOLAR INVESTIGATIVE TECHNIQUES

Arnold H. Menesses, M.D., Wendy B. Smoker, M.D., Lindell Gentry, M.D.
(Iowa City, la.)

MRI: somatofacial demonstration.

The cerebro-vascular junction (CVJ) with the paired neurovascular bundles of the cervico-medullary junction (CMJ) make this the most complex region of the brain. The CVJ was described by us in 1980 based on imaging by dense pleuroventralized myelography, computed tomography and CT myelography that demonstrated excellent neuropathology of the posterior fossa and superior temporal lobe discrimination. A prospective study is undertaken to investigate the role which MRI can play here.

Twenty children with symptoms referable to the CVJ-CMJ were studied by current investigational methods and MRI over a four month period. MRI images were obtained on Picker 0.9 Tesla super conductsive unit using sagittal, coronal and axial planes. Saturation, recovery and spin echo techniques were utilized. Lesions included brain, periventricular, choroid plexus, medulloblastoma, Chiari malformations (ACM), hydromyelia, brain stem and cerebral cord tumors, demyelination and arachnoid bands. MRI provided superior visualization of brain stem, cerebellum and cerebral cord pathology, and altered treatment course in 5 children. It failed to demonstrate hydromyelia in 2 and ACM in 1 patient due to high cervical cord tumor mimicking hydromyelia with ACM was made. Ongoing relationships were best demonstrated on pleuroventralized myelography.

Proton Nuclear MRI is non-invasive, versatile and particularly suited to study the posterior fossa. Its short coming must be apportioned as it rightfully becomes the primary procedure of choice in assessing lesions of CVJ and CMJ.

17. MAGNETIC RESONANCE IMAGING IN SPINAL DEFORMITY

Joan L. Yous, M.D., Alex M. Aisen, M.D., Michael A. DiPietro, M.D., James Blake, M.D. (Ann Arbor, Ml.)

The advantage of a non-invasive study which does not require exposure of the infant to radiation energies hardly needs comment. However, in addition to some obvious advantages, Magnetic Resonance Imaging (MRI) appears to be uniquely suited to the resolution of two of the major problems areas confronting the neurosurgeon in evaluation of the child with spinal dysraphism:

1) The presence of multiple minor anomalies in the child with repaired menisceple and symptoms of late onset cord ischemia.
2) The exact relationship of the cord to the intraspinal lumps in cases of lipomyelomeningocele.

We would like to briefly present five representative cases in which the remarkable clarity of detail of the MRI contributed to the diagnostic evaluation. Four/five are children and one is an adult with repaired menisceple. The cases illustrate examples of chondral spines with an intraspinal lipoma, a lipomyelomeningocele, hydromyelia, Arnold-Chiari malformation and postoperative syrinx formation. Comparison with high Resolution Computed Tomography (HRCT) demonstrates the advantages of MRI in patients with these disorders. Increasing familiarity with this modality and the use of presently available modifications, e.g., the spine coil, will likely result in MRI becoming the diagnostic procedure of choice in those areas of the world in which it is available.

18. SURGICAL CORRELATES OF NUCLEAR MAGNETIC RESONANCE (MRI)

Marsh Noufarri, M.D., Joseph F. Hahn, M.D., Michael T. Modic, M.D., Meredith Weinsteigen, M.D. (Cleveland, Oh.)

The purpose of this paper is to analyse our experience with MRI imaging in children and young adults (13 years) with special emphasis on the MRI of the spine in congenital anomalies and extramedullary tumours. Note is taken that the head MRI data in tumors of childhood are similar to what is reported last year at this meeting by Lawrence et al. (Paper 27, 12th Annual Meeting of the Pediatric Section of the AANS). We should, however, that MRI is extremely helpful not only in tumors of the posterior fossa and cervicomedullary junction but also in demonstrating small, less common lesions causing hydrocephalus and syringomyelia and in non-tumorous lesions. Other imaging modality had failed to reveal these lesions.

A variety of techniques were used to obtain the MRI images. The so-called T1 weighted images are especially helpful in spine MRI because the C7 appears white hence acting like a contrast medium. A total of 24 cases are presented. These are subdivided for convenience into 5 groups:

1. The Chiari malformation-syringomyelia group, 15 cases, the aneurysms were clearly depicted by MRI, and this is in agreement with the experience of others.
2. The neurofibromatosis-benign tumors group, 6 cases, three patients had more than one lesion and the sector CT with metrizamide showed the small lesions to a better advantage.
3. The lipoma-dermoid group, 3 cases, well demonstrated by MRI.
4. One case of C7-C8 sibilation in a child with achondroplasia. The MRI finding elicitation views were particularly helpful.
5. One case of cord AVM, poor visualization by MRI.

The MRI appears to be a safe, radiation-free and noninvasive imaging technique of the spine. Metrizamide sector CT and myelography are still superior in certain instances.
22. PROGRESSIVE CAUDA EQUSA SYNDROME IN CHILDREN WITH THE CAUDAL ENDODURAL STIORMNE

imperosita

A. C. Reynolds, M.D., Michael Pollay, M.D., Patrick Barnes, M.D.,
A. Sullivan, M.D., E. L. Smith, M.D., N. Tomell, M.D., Z. Rodentmeier, M.D.,
W. Barnes, M.D., P. Laster, M.D. (Oklahoma City, OK)

It has been known for many years that children with bony sacral anomalies with
neurological dysfunction. It has also been known for many years that bony
sacral anomalies are associated with the caudal endodermal syndrome which is
manifested by imperosita. sacral stenosis, sacral anomalies, i.e., the
or cloacal exstrophy. This syndrome has been considered static, and these children
have been cared for in myeloneuropathy clinics. Recently, we have had three
children and one adult develop delayed neurological progression after repair of
imperosita anus in three and ilestastia in the other. All of these
children had sacral anomalies on plain films and myelography revealed surgically
removable dysraphic myelodysplasia in three and a dural sac stenosis.

As a result of these patients and because of a few case reports from other
institutions we have begun systematic review of all children with caudal
gastrointestinal and genitourinary syndromes. Imaging techniques have included
plain films in 96, spinal ultrasound in 4, magnetic resonance imaging in 10,
metrizamide myelography in 11, digital subtraction myelography in 6, and
computed tomography in 9. Of the 96 patients with caudal endodermal
syndromes between July, 1976 and April, 1984, 38 had findings of sacral and/or
other pelvic anomalies including agenesia, hypoplasia, fusion-segmentation
anomalies and dysraphic defects. As of August, 1984, 24 children have undergone
spinal cord imaging with confirmation of dysraphic myelodysplasia in 14.
The findings in these children with imperosita include lumbosacral thick filum in 2,
thick filum in 2, dural sac stenosis in 2, dysplastic corpus in 3, hypoplastic corona in 2,
congenital anomalies in 1, low conus with dural ectasia in 1, and pelvic
meningocele in 1. To date surgery has been accomplished in 13 of the 14
children with our standard technique of microsurgical approach to the
intra-abdominal cavity and reconstruction of neural and vascular structures.

As with lumbosacral myelodysplasia prevention of neurological deterioration is
of paramount importance because once deterioration occurs it is likely
that intervention is possible after surgical release. Our adult patient deserves
special mention because he had a stable neurological condition for 30 years and then
had deterioration of his leg function with sensory secondary to an intradural
lumbar with tethered cord syndrome. Our recommendation is to image
these children in early infancy and to repair them between 3 and 6 months of life to
prevent delayed neurological deterioration.

23. VEIN OF GALEN ANEURYSM: COMBINED TREATMENT BY EMBOLOYSE AND SURGERY

Jeffrey S. Wisoff, M.D., Alejandro Berenstein, M.D., Fred J. Epstein, M.D.
(Old Westbury, NY.)

Between June 1979 and July 1984 seventeen patients with vein of Galen aneurysm
were seen at the New York University Medical Center. Five of the seventeen
patients were neonates, eight were infants (4-12 mo.), three were older children,
and one was an adult. All of the neonates presented with intractable congestive
heart failure. Neurological and developmental deterioration was the predominant
presentation among the infants and older children. CT scans demonstrated
progressive cerebral stropho and dystrophic calcification consistent with a
progressive ischemic encephalopathy.

The treatment strategy that has evolved is based on whether the patient presents
with heart failure or ischemia deficits. In the neonate with intractable heart
failure embolization of a significant portion of the fistula to allow resolution of the
heart failure has been successful in 4/5 patients. In the older patient with
ischemic encephalopathy, sequential staged embolizations are utilized to obturate
the majority of the malformation. Surgery is utilized to obturate anterior
cerebral feeders by direct clipping and intraoperative embolization and to
control hydrocephalus.

The mortality in our series was 18% (2/17) including one neonate. The dramatic
improvement in case mortality and morbidity using embolization techniques over
conventional surgical approaches and our methods of treating these lesions will
be discussed.
24. THE TRANSMUCOCULAR APPROACH TO VEIN OF GALEN ANEURYSMS - A PRELIMINARY REPORT
J. Parker Mickle, M.D. (Gainesville, Fla.)

The surgical treatment of Vein of Galen aneurysms continues to be difficult and at times controversial. Interventional efforts for these deep Galenic malformations range from direct surgical approach to feeding arteries to direct instillation of various thrombogenic agents into the malformations.

Two patients (three months and four years) with large Vein of Galen aneurysms were treated at the University of Florida Medical Center by the transmucocircular approach. A total of 22 Gianturco coils were placed in these ten patients in a total of four procedures. The surgical procedure consisted of localizing the tumor and straight sinus and Vein of Galen aneurysm with real time ultrasound after a small craniotomy over the tumor. A standard 8 cm. angiography catheter placed into the Vein of Galen, the Gianturco coils were deposited within the Vein of Galen aneurysm with a special catheter delivery set developed at the University of Florida. This system makes the delivery of these coils safe and specific. Pre and post embolization the patients have been studied with digital angiography and ultrasonic doppler.

Both patients have had dramatic changes in their preembolization seizure patterns. The flow changes induced by the coils were dramatic. The potential for continued thrombosis exists around these thrombogenic wires. The feasibility of this approach for treating Galen malformations will be discussed.

25. CEREBRAL MALFORMATIONS IN CHILDREN: A RETROSPECTIVE ANALYSIS OF 28 CASES
Francisco A. Gutierrez, M.D., David G. McGone, M. D., Thomas P. Waldich, M.D. (Chicago, I1.)

Twenty-eight pediatric patients with documented arteriovenous malformations of the brain which were reviewed between December 1974 and November 1983. Patients older than 16 years, patients with arteriovenous malformations (AVM's) of the Vein of Galen or the spinal cord were excluded from this study.

The clinical signs and symptoms were analyzed at presentation and after "definitive therapy". The malformations were classified as wholly pial-parenchymal AVM's (23) and as dural AVM's (3). Spontaneous subarachnoid hemorrhage was the most frequent finding at presentation (18 patients, 64%). In six patients (21%), the initial hemorrhage was accompanied by acute seizures. Chronic seizures (epilepsy) were present in 5 patients (18%). An audible bruit was detected in 4 patients (14%). Recurrent episodes of headaches were reported by the majority of patients. The angiographically occult vascular malformation was present in 4 patients (14.2%). Twenty-four of the 21 patients underwent surgical treatment for AVM. 18 patients had total exclusion of the AVM. 6 had partial exclusion of the AVM and 4 patients were treated conservatively. Five patients required more than one surgical procedure to achieve partial or complete obliteration of the malformation. Analysis of outcome after treatment for the entire group of 28 patients, regardless of lesion location or type of treatment, indicates that 19 children (68%) were normal, 3 (10%) had mild neurologic deficit, 2 (7%) were disabled, and 2 (7%) died. The two deaths in our series were attributed with partial resection of the AVM.

We consider seizures to be sufficient indication for "prophylactic" resection of the lesion, provided such resection is anatomically feasible.
27. AN EXPERIMENTAL MODEL SHOWING WHY THE SUBTEMPORAL DECOMPRESSION SHOULD WORK IN THE SLIT VENTRICLE SYNDROME WITH SOME SUGGESTIONS AS TO WHY IT DOESN'T WORK OPGH ENOUGH.

Robert Breese, M.D., J. Gordon McCullough, M.D. (Los Angeles, Ca.)

Severe ventriculitis in an infant or child can cause extensive and widespread periventricular and paraependymal damage. The infection sometimes produces multiple isolated expanding CSF filled cavities within or adjacent to the ventricles, with resultant obstructed flow of CSF from two months to seven years, sustained severe ventriculitis caused by one or more organisms. In our series, we evaluated thirty pediatric patients the cavity associated with obstructed flow, and in the fourth no known predisposing factor was present. After the ventriculitis was successfully treated each patient developed multiple isolated expanding CSF filled cysts as documented by metrizamide ventriculography. If the patient is to be treated the alternatives include multiple shunts or fenestration of the cavities into one another. Ideally requiring multiple shunts might be advantageous. A unilateral posterior parietal craniotomy with a 2-3 cm cortical incision allowed for adequate visualization and fenestration of the various isolated cavities with use of the operating microscope. Multiple procedures were necessary in some cases. Repeated CT scanning, with needle ventriculography as necessary, was used to document the success of the fenestrations. In all four patients the hydrocephalus has been controlled, without shunt failure, without increase in neurologic deficit or associated surgical complication.

29. LOCULATED VENTRICLES - ARE THEY?

David G. Notone, M.D., Ph.D., Thomas F. Heidich, M.D. (Chicago, Ill.)

In addition to the developmental deficits inflicted on children by ventriculitis, loculated noncommunicating cerebrospinal fluid spaces may be responsible for the neurologic problems of the child. Hydrocephalus is impossible. Multiple shunts, frequent revisions, recurrent infections, and, often, cranioptony with laser fenestration are needed to control the intracranial dynamics.

In an attempt to illustrate the mechanisms involved, normal and hydrocephalic mice had silk sutured deliberately contaminated with gram positive and gram negative bacteria placed within their lateral ventricles. Both types of organisms produced the changes at the catheter tip. The infection spread preferentially along the extracerebral space of the white matter tracts deep to the ependyma and subependymal glial lay. A sequence of edema, small cysts, and coalescence of cysts to form large periventricular cavities invariably occurred. Immaturity and hydrocephalus facilitated this process.

Review of CT scans of children progressing to "compartmentalization" suggests a similar if not identical process in humans. Periventricular demarcation progressed to cysts. The ventricular catheter was often placed toward the midline as the multiple cysts coalesced and compressed the ventricular system. Electromyocardopic examination of the septa between cavities revealed myelinated axons, indicating that the septa are indeed brain and not glial scar or ependymal adherences. In the animal model, the cysts often assumed a size equal to or greater than the shunted ventricular system. Preliminary evidence would indicate that suppressive treatment of ventriculitis, including ventricular irrigation, might abort this process.

30. VENTRICULOCEPHALIC SHUNT IN EIGHT-YEAR-BIEN ENDURING UNDER 2,000 GRAMS OF WEIGHT - CLINICAL REPORT

Norton E. James, M.D., B. Beiler, M.D., G. Schneiter, M.D. (San Diego, Calif.)

31 low birth weight and high risk newborns who developed progressive hydrocephalus while a period of intermittent lumbar punctures, underwent a ventriculoperitoneal shunt replacement. They were all under 2,000 g at the time of shunt (mean 1,600 g). The operative procedures were performed at a mean age of 3.1 weeks (1.5-5.0). There were no deaths in this series. During the nursery stay, 14 patients required operative revisions for complications. The most common problem was infection which occurred in 13 (43.8%) before the primary intervention, and another 5 of the 14 (35.7%) after the primary intervention. Overall infection rate per patient was 13.4%. Shunt removal and intensive antibiotic therapy cured the infection and all patients were discharged home. All newborns and children with ventriculitis underwent ventriculoperitoneal shunts understanding that certain requirements need to be met: a stable systolic course with no further obstructive intracranial pressure, obstruction and infection, and if these are the not the procedures can be done with a low incidence of morbidity and mortality.
Arterial Injuries in Surgery


described the sudden death of a patient following thoracic surgery. The patient had been operated on for aortic aneurysm, and the operation was uneventful. However, during the postoperative period, the patient developed signs of cardiac arrest. The authors hypothesized that the sudden death was due to a surgical complication, possibly an embolus.

The authors concluded that although the operation was performed successfully, the patient's sudden death was likely due to a surgical complication. They suggested that future studies should focus on identifying the specific cause of the complication to improve patient outcomes.

In summary, the case study presented here highlights the importance of thorough preoperative evaluation and intraoperative monitoring to prevent catastrophic outcomes. Further research is needed to identify the causes of such complications and develop strategies to prevent them.
37. THE PATHOPHYSIOLOGY OF IVH IN THE BEAGLE PUPPY
Dennis L. Johnson, M.D., Catherine Sheer, M.D., David C. McCulloch, M.D.
(Washington, DC)
The term beagle puppy has been used extensively as an experimental model of IVH in the neonatal infant. We have reproduced this model in our own laboratory and are reporting our analysis of 16 preparations. In order to substantiate variables contributing to the model, the pathophysiological sequence of events was divided into 3 distinct phases: 1) hemorrhagic hypertension, 2) hyperperfusion, 3) postinfarct. We selected variables hypothesized to play a role in IVH and submitted subsets selected in the context of these pathophysiological phases to 3 separate discriminant function analyzers. In the first analysis, only the measurements for variables representing pre-reinfusion events were utilized. Variables included weight, volume of bleed, mean temperature, the difference between the pre- and posthemorrhage hematocrit, arterial pt, arterial pCO2, baseline blood pressure prior to induced hypertension, the level of hypertension, and the degree to which the BF recovered prior to reinfusion. Three variables -- temperature, baseline BP, and pCO2 -- provided perfect (100%) correct classification. In the second discriminant analysis variables representing the events associated most closely with hyperperfusion, the BP after infusion and the duration of hypertension were added to the previously considered variables for determining their potential classification ability. Again perfect group classifications were obtained using only the four variables of weight, change in hematocrit, pt, and the BP after reinfusion. Finally, in the third phase, the aftermath of reinfusion/hypertension, additional variables included the BP after 10, 20, 30, 40, 50 and 60 minutes. The animal blood volume, arterial pCO2, and BP after 50 minutes perfectly classified all animals into their groupings. This data supports our hypothesis that reinfusion injury is the fundamental pathophysiological basis of IVH and that hemodynamic changes are secondary.

38. IN VITRO EVALUATION OF CBF SHUNT FUNCTION BY RADIOISOTOPIC CLEARANCE STUDIES.
Bruce D. Pendleton, M.D., P. Alex Roberts, Ph.D., Arden J. Reynolds, Jr., M.D.,
Michael Folley, M.D. (Oklahoma City, OK)
In order to evaluate shunt function in the hypothermic patient, a study was undertaken to relate the clearance of a radio-labeled marker from the reservoir or chamber of a Ventriculostatic shunting system and flow through the valve system. An in vitro study was conducted on a number of commercially available shunting devices which included: adult and pediatric Ommaya, valve, the standard and experimental Fuentes-Schulte Valve, Holter-Bochner Cruciform all valve, Holter-Bochner cruciform, valve, a Nether-Schulte mini LPV, a Nether-Schulte standard LPV and a Nether-Schulte Pol's reservoir. The method used was based on the injection of 0.5 ml of 113mIn-DTPA into the valve reservoir or chamber as a bolus. Following this, into the flow pump, a nonisotopic fluid was infused at rates varying between 0.46 and 0.034 ml/min. The radioactivity was counted with a scintillation counter and accumulated at five second intervals on a multi-channel analyzer. The studies were done in triplicate at each flow rate and a worst case log values of counts versus time in seconds was constructed. From these graphs a mean t1/2 was computed for each flow rate and this value used to construct a second graph in which flow rate was presented versus t1/2 (seconds). Each of the valve systems studied demonstrated a different and complex relationship between flow rate and half-time of clearance. A best fit curve of flow rate versus t1/2 was constructed for each system and the maximum flow rate could be determined for each valve based on the measured half-time (t1/2 of isotope clearance). The graphical solution from these experimentally derived curves is proposed as a quick method for evaluating shunt function in the clinical situation.

39. ABDOMINAL CSF CYST SYNDROME: DIAGNOSIS AND MANAGEMENT.
Herbert E. Engelman, M.D., Yoon S. Bahn, M.D. (Chicago, IL)
Twenty cases of abdominal cerebrospinal fluid cyst syndrome presenting to Chicago Children's Memorial Hospital over the past two years were reviewed. The syndrome occurring in patients with ventriculoperitoneal (VP) shunts consists of the findings of an acute abdomen and symptoms, to a varying lesser extent, of a shunt malfunction. Physical examination reveals fever, ileus, and diffuse abdominal tenderness, often with drawing up of the knees. Vomiting, diarrhea, or abdominal distention were sometimes present. The clinical picture was most often confused with the diagnosis of peritonitis resulting from bowel perforation.

Diagnostic studies included abdominal x-rays, head CT scan, abdominal ultrasound and CBF cultures. Head CT scans were either unchanged from prior studies, or showed mild dilatation of the ventricles. Abdominal ultrasound studies revealed the presence of a cystic fluid collection in all cases. CSF cultures were usually negative. When positive, the most common organism found was Staphylococcus aureus. Prophylaxis consisted of an abdominal drain plus an external ventricular drain (EVD). When cultures were consistently negative, the EVD was replaced. All cases, the VP shunt was found to be functional, and the abdominal cyst to be under pressure. Prophylactic antibiotics were ordered for the duration of the hospital. In all cases, the symptoms quickly resolved after EVD placement. The pathophysiology of the cyst formation is poorly understood. Most patients had had prior shunt revisions. The cyst is believed to result from loculation and inadequate absorption of the CSF due to adhesions within the abdominal cavity. It is hoped that a better appreciation of the nature of the abdominal CSF cyst syndrome will aid in its rapid diagnosis and treatment, with the avoidance of needless procedures such as exploratory laparotomy.

40. NOYA NOYA: EXPERIENCE AT THE HOSPITAL FOR SICK CHILDREN, TORONTO.
Maradith V. Giles, M.D., Harold J. Hoffmann, M.D. (Toronto, Canada)
Between 1970 and 1981 ten verified cases of Noya Noya were treated at the Hospital for Sick Children in Toronto. The children presented between one and twelve years of age. There were four males and six females. One patient was oriental and the rest caucasian.

Seven patients underwent recanalization procedures, with STA-MCA anastomosis for repair of the temporal lobe synangiosis. Follow-up has ranged from one to six years. All patients with STA-MCA anastomosis are neurologically intact. The patients with synangiosis are stable and functional with mild deficits. Two patients without recanalization procedures died. Another untreated patient is alive but retarded and hemiplegic.

2 peaks 1st decade Repeated infants
adult SAT
15% total
72% sig inrapid neurologi
defect
C Surgial Rx
92% good results
often 3 develop
tangraphic collateral
41. EXTREME HYPERVENTILATION AND CEREBRAL BIOENERGETICS IN THE CAT

Patricia Gibbons, M.D., David Swedlow, M.D., Frank Walsh, Ph.D., Derek A. Bruce, M.D., Ph.D. (Philadelphia, PA)

Nine cats were anesthetized with intraperitoneal ketamine (10 mg/Kg), paralyzed, intubated and artificially ventilated with 30% P02 and room air. Anesthesia was maintained with continuous infusion of IV ketamine and halothane. End-tidal CO2 and temperature were continuously recorded. A femoral artery and vein were cannulated and used for continuous recording of blood pressure and for intermittent sampling of arterial blood for measurements of Pao2, Paco2, pH and nitrous oxide during cerebral blood flow. The cat was then placed in a stereotactic frame, the scalp reflected and two electrode plates placed, one in either frontal area and a third placed over the frontal sinus with reference electrodes to both ears. Both median nerves were stimulated percutaneously using needle electrodes and the median nerve stimulation and frontal recordings were used to measure somatosensory evoked responses (SERS). The sagittal sinus was then cannulated with PEG tubing for sampling of venous blood for oxygen and cerebral blood flow (CBF). CBF measurements were performed by the addition of 14CO2 to the inspired gas. Arterial and cerebral venous blood samples were obtained over a 20-minute period and measurements of nitrous oxide concentration made. Blood flow was calculated using the modified Kety-Schmidt technique.

Cerebral blood flow and arteriovenous oxygen difference across the brain were measured at an arterial CO2 baseline of 38. The animal was hyper-ventilated for 45 minutes to a Paco2 of around 20. A second blood flow and AV difference of oxygen measured, and final ventilation was increased to drop the Paco2 to approximately 15 torr for 45 minutes at which time a third CBF measurement and AV difference was drawn. The brain was then superfused with liquid nitrogen and frozen in slabs. The brain was then sliced at 0.5 mm thickness, fixed at 0.1% paraformaldehyde and soaked in the grey and white matter.

CBF decreased from 40.9 ± 8 ml/100 gm/min at Paco2 of 38 to 26 ± 6 ml/100 gm/min at Paco2 of 15. The initial AV oxygen difference was 44 at Paco2 of 15. It fell to 24 at Paco2 of 10, slightly further to 3. There was no change in the somatosensory evoked responses.

Table 1 shows the results of cortical metabolites:

<table>
<thead>
<tr>
<th></th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATP mmol/kg</td>
<td>2.06 (0.67)</td>
<td>2.46 (0.74)</td>
</tr>
<tr>
<td>PCr mmol/kg</td>
<td>3.80 (1.07)</td>
<td>4.00 (0.87)</td>
</tr>
<tr>
<td>LAC mmol/kg</td>
<td>4.80 (1.14)</td>
<td>4.30 (1.7)</td>
</tr>
</tbody>
</table>

CONCLUSION

No evidence of brain ischemia was found.

42. OPERATIVE PLANNING FOR CONGENITAL CEREBRAL MALFORMATIONS AND HYDROCEPHALUS: BENEFIT OF STABLE XENON COMPUTED TOMOGRAPHY

K. E. Manweiler, M.D., T. J. Tarby, M.D., J. A. Hoek, M.D., Hal W. Pittman, M.D. (Phoenix, AZ)

Conventional cerebral malformations and hydrocephalus may be accompanied by aberrations in cerebral blood flow. These aberrations may result from parenchymal maldevelopment, malformation of the cerebral vasculature, or reflect an as yet undetermined as a secondary process. We have utilized stable xenon computed tomography to evaluate regional cerebral blood flow (CBF) in children with four different cerebral pathologies in anticipation of surgical intervention: a thalamic Vein of Galen aneurysm, hemimegalencephaly, Sturge-Weber syndrome, and hydrocephalus of posthemorrhagic origin.

In the patient with a Vein of Galen aneurysm, no aneurysmal flow was demonstrable; impression of thrombosis was confirmed by angiography. The only surgical intervention was ventriculoperitoneal shunting.

In hemimegalencephaly, the abnormal hemisphere showed markedly increased CBF when compared to the putatively normal hemisphere. Thus increased flow correlated with increased vessel caliber noted at angiography and subsequent hemisecrectomy.

In the case of trigeminoencephalosynapsis, CT scan showed only a mild asymmetry in hemispheric size; cerebral angiography was unremarkable. Stable xenon CT revealed a marked deficit in periventricular blood flow in the hemisphere underlying the leptomeningeal vascular malformation, suggesting a clinically significant deficit in CBF.

Six cases of neonatal posthemorrhagic hydrocephalus showed asymmetry in CBF, most pronounced in the parasagittal-opercular regions of the cortex in the midline, with more anterior hemorrhage. While two of these post-dural ligation scans showed improvement in flow, significant asymmetries persisted suggesting a primary ischemic process.

We believe these examples represent the first demonstration of the utility of stable xenon computed tomography in assessment of regional neurologic conditions of childhood.

43. TEMPORAL LOBECTOMY IN CHILDREN WITH EPILEPSY


The surgical results of temporal lobectomy for medically refractory seizures in 50 patients under the age of twenty are analyzed. There were 49 males and 11 females with an average age of 15.8 years. The average age at onset of seizures was 11.8 years. The median time between the onset of seizures and surgery was 8.1 years. There was a significant history of antecedent factors in 45 patients. Preoperatively, five patients had I 4 ± month, ten had 5-10 months, twenty had 11-20 months, and twenty had over 20 months. Preoperatively, 51% were seizure free, 12 patients (24%) had only partial seizures. Of 45 patients 17% were unchanged, and 64% (31%) were unchanged. Therefore, 12% were unchanged, 47% improved, and 8% benefited significantly and the QOL improved. Forty-three out of forty patients who responded to a questionnaire felt that their social interaction and intellectual development had improved related to the operation. Overall, there was no significant change in Wechsler Intelligence Tests. However, there was a greater likelihood of the patient improving (p < 0.01) in both verbal IQ and performance IQ if the operation was done earlier. Six patients had tummy, three of which were uncorrected by presurgical EEG scan and angiography. Complications included 2 transient upper extremity paresis, 4 with transient anoxic encephalopathy, and 1 with transient expressive aphasia. Since the surgical results are excellent in terms of seizure control and improved social function, it is recommended that temporal lobectomy be considered early in the treatment plan for medical refractory temporal lobe seizures in children.
44. SPONTANEOUS EPIDURAL CERVICAL THORACIC HERNIA EXTENDING FROM C3 TO T3 IN A CHILD
Joan B. Humphreys, M.D., John P. Laurent, M.D., William R. Cheek, M.D.,
Salem Mashad, M.D. (Houston, TX)
Spontaneous epidural spinal hernia is extremely rare, and only 3 cases have previously been reported in children under 10 years of age. In adults patients, 17 have died when the herniation extended above C5. Although the term has been entertained as the etiology, the causes remain unknown. A 6 year old patient presented with a 1 week history of severe intercostal and neck pain, progressive arm and leg weakness, and low grade fever. There was no history of trauma. Physical examination confirmed quadriparesis with atrophy of intrinsic muscles of the hand. Magnetic resonance (MR) and metrizamide computed tomographic scans showed an epidural mass extending from C1 to T1. Laminectomies were performed and revealed an encapsulated mass underlying the ligamen
tum flavum. It contained fluid characteristic of a chronic herniation under pressure. Examination of the tissue showed no evidence of vascular malforma
tion, neoplasm or infection. Cerebrospinal fluid, coagulation and collagen vascu
lar studies were normal. In defining the diagnosis of an epidural spinal mass in children, non-invasive diagnostic tests are preferable. This is the first reported case of a chronic spinal epidural herniation diagnosed by magnetic resonance and demonstrates its superiority in directing surgical intervention.

45. SELECTIVE POSTERIOR REHABILITATION FOR THE RELIEF OF SPASTICITY
W. J. Peacock, B.Sc., M.D.; Ch.B.; F.R.C.S.(Edin) (Cape Town)
In the 1980's Sherrington showed that experimentally produced spasticity could be relieved by sectioning posterior spinal roots. However, in clinical practice the resultant sensory loss made this procedure unacceptable. Posterior rootlet section could be performed whereby rootlets not involved in abnormal circuits might be preserved and only those associated with abnormal responses were divided.

At the University of Cape Town, between 1983 and 1984, 67 patients suffering from the effects of spasticity were subjected to selective posterior rhizotomy. There were 58 cases of cerebral palsy, 31 being spastic diplegia, 24 spastic quadriplegia and 4 spastic tetraplegia. Seven patients were spastic due to cerebral cord disease, 2 due to a stroke and 1 was hemiplegic following cerebral trauma. The procedure is performed via lumbar laminectomy exposing the cauda equina. Posterior lumbar and sacral rootlets are individually stimulated with a nerve stimulator using specific intensity and pulse duration settings and those root
lets with abnormal motor responses are divided. Postoperatively, spasticity has been reduced in all cases and gross movements such as those involved with reaching, standing, and walking were improved as were fine movements. In almost all cases an improvement in mood was noted.

Indications for and contra-indications to selective posterior rhizotomy and details of technique will be discussed. A film illustrating patients' pre-
operative and post-operative abilities will be shown.

46. INFRAPRICAL ARACHNOID CYSTS IN CHILDREN
G. R. Harsh, IV, M.D.; M.B.E.Edwards, M.D.; C. B. Wilson, M.D. (San Francisco, CA)
Controversy in the literature concerning approach for intracranial arachnoid cysts prompted this review of 16 pediatric cases. Presentation re
fected anatomic distribution: middle cranial fossa cysts (4) caused headache, seizure, or focal neurologic deficit; suprasellar cysts (5) presented with intracranial hypertension, visual symptoms, precocious puberty, or bobble-head doll syndrome; diffuse supratentorial (2) and posterior fossa (5) cysts led to intracranial hypertension or developmental delay. Ventriculomegaly occurred in 7 of 11 supratentorial and 5 of 5 infratentorial cysts. CT scanning or magnetic resonance imaging (MRI) alone was diagnostic in 23 cases. Three of seven supratentorial cysts treated by craniotomy for fenestration re
quired each responded to subsequent cyst-peritoneal shunting. Two patients with posterior fossa cysts treated by fenestration failed to benefit; one who subsequently received combined ventriculo-peritoneal and cyst-peritoneal shunting improved. Cyst fenestration was frequently followed by lethargy and fever suggestive of asptic meningitis. The four patients with supratentorial and the three with infratentorial cysts treated initially by shunting did well. Following shunting there was decrease in cyst and/or ventricular size and no morbidity. Individual cases showed the value of preoperative diagnosis, MRI in excluding tumor and delineating cyst boundaries, ultrasonographic monitoring of asymptomatic and postoperative infants, and ultrasound guidance of catheter placement.

Cyst-peritoneal shunting should be performed on all symptomatic patients. If ventriculomegaly is present, combined cyst and ven
tricle shunts are indicated. Craniotomy for fenestration and studies assessing cyst communication with ventricular and subarachnoid spaces should be reserved for cysts refractory to shunting and, in older patients, for cysts adjacent to larger basilar sin
uses.

47. THE MANIFESTATIONS AND MANAGEMENT OF HYDROSYRINGOMYELIA IN CHILDHOOD
John Meil, M.D., Harold L. Befmann, M.D., E. Bruce Hendrick, M.D.
Ralph P. Humphreys, M.D. (Jackson, MS)
Fifty patients were treated surgically for hydrosyringomyelia from February 1973 to April 1984, at the Hospital for Sick Children in Toronto. This report is based on review of their radiographic and medical records. Forty-three patients had radiographic or surgically confirmed malformations of the hindbrain. These included patients with the Chiari type II malformation, 12 patients with the Chiari type I malformation and 6 patients with "acquired" Chiari type I malforma
tion. These patients with the Chiari type II malformation presented with classical syringomyelic syndromes, atypical syringomyelic syndromes (i.e. primary lower extremity dysfunction with normal upper extremities), or spina bi
nalis. Five of the "acquired" Chiari Malformations had undergone lumber
peritoneal shunting as infants. Forty-one of the patients were studied initial
ly with metrizamide myelography and computed spinal tomography. Six of the other 7 patients had other abnormalities of the spinal canal, but no demonstrable hindbrain abnormality. We present the clinical and radiographic findings in each group followed by our surgical methods and results. We con
clude that virtually all cases of hydrosyringomyelia are associated with hindbrain anomalies and that posterior fossa decompression with occlusion of the central canal at the obex is a safe and effective form of therapy.
49. OCCIPITAL PLAGIOCEPHALY DUE TO UNILATERAL LAMBDOID SYNOSTOSES - A REAPPRAISAL AND SOME NEW THOUGHTS

Clinton Frederick Miller, M.D., John W. Skinner, M.D., Joseph M. Naedel, M.D. (New Orleans, LA)

There has been a trend toward earlier correction of craniofacial syndromes in order to take advantage of "passive" remodeling of the craniofacial skeleton during the rapid phase of infantile brain growth. Of the craniosynostoses, one syndrome - occipital plagiocephaly due to unilateral lambdoid synostosis - has received less attention despite the fact that it is more likely to receive delayed or no treatment. This lack of attention correlates with diagnostic insecurity attributable to many factors, some of which are: personal pathogenetic confusion with so-called "positional flattening"; falsely reassuring roentgenographic findings; dissatisfaction with cosmetic results of often delayed surgery; cavalier assumption of innocuous cosmetic impact if left untreated; and, historical prejudice engendered by its reported rarity (2% of Boston Children's Hospital series vs 94 of Toronto Sick Children's Hospital series). Seven pathologically verified cases of typical unilateral lambdoid synostosis in less than one year's time (infants aged 3 to 8 months) caught our attention and prompted this reappraisal. We would like to present some old and new observations, clinical and radiological, helpful in making an earlier and more secure diagnosis; and to propose a new mechanical explanation of how the observed pathology (paramastoid erosive ridging) results in occipital flattening - plagiocephaly.

49. TERMINAL NYELLECTOSTOCE

Thomas F. Maidich, M.D., David G. McNeal, M.D., Radiology (Cleveland, OH)

Terminal nyellectostoles constitute approximately 5% of skin-covered lumbar sacral masses and are especially common in patients with cloacal exstrophy. Pathologically, terminal nyellectostoles consist of (a) a thin arachnoideal membrane which is directly continuous with the dural arachnoid space and (b) a low-lying, hydromyelic spinal cord which traverses the meninegocoele and then expands into a large terminal cyst. The terminal cyst bulges into the extrathecal compartment caudad to the meninegocoele and forms a distal sac which does not communicate with the subarachnoid space. The terminal cyst is lined by ependyma and tectorial lamella. It is directly continuous with the dilated central canal of the cord, and dilates to the arachnoid villi. Special hydromyelic proctophimosis is characteristic of this specific form of syringobulbia. Since patients with terminal nyellectostoles have normal intellectual potential and do not usually have a visual deficit, they must be identified and repaired early, prior to onset of severe lower extremity paralysis.

50. INCREASE IN VENTRICULAR SIZE WITH HIGH PRESSURE INFUSION OF ARTIFICIAL CSF INTO THE LATERAL VENTRICLE OF DOGS

Harold L. Breakey, M.D., Scott Erwood, M.D., Howard Chiseck, DSc. (Cleveland, OH)

The question of the mechanism of hydrocephalus produced by choroid plexus papillomas has been thoroughly debated in the literature and it is clear that some choroid plexus papillomas do produce large volumes of CSF. Whether this overproduction of CSF without obstruction to outflow or pressure augmentation is enough to cause hydrocephalus has yet to be delineated and is the central issue in these experiments. Five adult mongrel dogs were anesthetized and underwent cannulation of each lateral ventricle. One cc of Conray® was infused into each lateral ventricle for initial volumetric determination. Pressure was allowed to return to normal and an infusion of artificial CSF (Ringer's B solution) was begun using a pump with a feedback control mechanism to maintain ICP at 30 torr. After 16 hours a second Conray® ventriculogram was performed in each dog and then the ventricles casted with styrofoam®. Ventricular volumes increased in all dogs by an average of nine percent.

There are three important results of this study.
1. High pressure infusions of artificial CSF will produce ventriculomegaly
2. The volumetric measurements used can make those differences
3. The viscoselastic model of ventricular volume can predict these results.

51. HYDROCEPHALUS: SYMPTOMATIC LOW ICP AND ASYMPTOMATIC SLIT-VENTRICLE SYNDROMES TREATED BY FLO-CONTROL VALVE SHUNTING

Eldon L. Folts, M.D., Jeffrey Blanks, B.A. (Orange, CA)

I. Clinical symptoms and signs of low ICP in shunted hydrocephalic patients are not widely recognized. Eight shunted hydrocephalic patients suffering from symptoms usually attributed to shunt obstruction with increased ICP were studied. Four of these had undergone futile shunt revisions for these symptoms elsewhere. All suffered from headaches, nausea and occasional vomiting during upright, and were largely relieved of these symptoms when lying down or in head down positions. Four patients developed blurry vision and mild diplopia after being upright, and three patients showed paraplegias of upper gaze. All shunts were VP shunts. Accurate CSF pressure studies showed low pressure, which fell to significant negative pressure in the upright position from minus 150 to minus 200. Pressure measurements in prone, upright and head dependent positions were critical data. Treatment with Flo-Control valves, medium (70-80 mm) and high pressure (80-120 mm) opening pressure gave prompt relief in all instances. The clinical aspects of such low ICP problems in shunted hydrocephalic patients needs emphasis.

II. Twenty-five patients with "slit ventricles" by CT scan, but without significant clinical symptoms, were studied as probable ICP problems. Twelve of these patients showed low ICP by measurement. All were treated with the same Flo-Control valve inserted into their shunt system. This increased intracranial pressure significantly but none showed any symptoms of such. Twelve patients showed enlarged ventricles to normal within three months by CT scan, but thirte en did not show ventricular enlargement subsequent to the revised shunt, presumably due to "stiff-slit" ventricles. This entity is as yet not clearly predictable.

The Flo-Control valve is a reliable pressure valve with flow control and flow rate characteristics which seem to handle the siphon problem in VP shunts.

The syndrome of symptomatic low ICP in hydrocephalic patients needs continued emphasis.
52. CRANIOFACIAL TECHNIQUES IN PEDIATRIC NEUROSURGERY

Larry V. Carson, M.D. (Augusta, GA)

Tumors involving the base of the cranium and face are sometimes difficult to expose and treat. The residual deformity after the treatment of such lesions may be significant. Craniofacial techniques provide improved exposure, facilitate extirpation of the lesion, and allow for reconstruction of the defect.

To provide improved exposure, the standard bicoronal flap may be split down the midline. The incision may then be carried directly down the midline or laterally around the nose and down the bital ridge to the lip. Circumferential elevation of the pericranium allows subperiosteal resection of the globe and surrounding structures. This exposure combined with a frontal craniotomy lends itself to en bloc resection of anterior cranial base or naso-orbital or facial extension. After verification of margin status, reconstruction may be performed using autogenous materials. Reconstruction minimizes the deformity and re-establishes the normal anatomy which may prevent cosmetically and complications.

A case of a child with osteogenic sarcoma involving the sphenoid, orbit, and the anterior fossa is presented to illustrate the advantages of craniofacial techniques in pediatric neurosurgery.

53. MODIFIED PRONE POSITION AND CROSS-BAR CRANIOTOMY FOR TOTAL CRANIAL VAULT RESHAPING

T. S. Park, M.D., Charles Z. Haworth, M.D., M. Sean Grady, M.D., John A. Jane, M.D.
Charlottesville, VA

Total cranial vault reshaping is indicated for successful correction of multiple suture dysostosis associated with craniofacial dysmorphia and macrocephaly due to advanced hydrocephalus. The major technical problems encountered during the operation are related to 1) positioning of the patient’s head and consequent limited access to the calvarium, 2) proper replacement of the fragmented calvarium following craniotomy, 3) excessive blood loss.

The authors have overcome the problem in positioning the patient’s head by utilizing a newly developed face frame that secures the patient in the prone position with hyperextended neck. This position allowed easy access to the calvarium from the supraorbital ridge to the foramen magnum and the total cranial reshaping to be performed at one stage.

Reconstruction of the calvarial contour following the extensive craniotomy was significantly facilitated by employing a single craniotomy flap in a curved cross-bar fashion. The cross-bar craniotomy flap consists of four bony bars that are continuous with each other at its central portion. It serves as a basic bony frame that holds the remaining bone flaps in the corrected position.

Blood loss throughout this extensive operative procedure was minimized by separation of the scalp from the pericranium followed by removal of the calvarium with pericranium in large segments and use of scalp clips and infiltration of the scalp with epinephrine.

The authors' experience with the operative techniques and postoperative results will be discussed.