Program for the Ninth Scientific Meeting of the International Society for Paediatric Neurosurgery

Budapest, Hungary, July 20–22, 1981

Monday, July 20, 1981
8.00–8.30
Opening ceremony: Hungarian Ministry of Health
Opening remarks: L. Basauri, E. Paraicz

8.30–10.00
Scientific Session I
(6 long papers: 10 min presentation, followed by 5 min discussion)
Chairmen: S. Matsumoto, D. Reigel

Yamada, H.; Nakamura, S.; Tanaka, Y.; Kageyama, N.: Ventriculographic and Cisternographic Studies Using Water-Soluble Contrast Media in Infants with Myelomeningocele

Oakes, J.: Symptomatic Chiari Malformation in Infancy and Childhood

Lopez Ramos, N.M.; Ajler, G.S.: Analysis of 111 Cases of Myelomeningocele

Woosley, R.E.: Impact of Early Shunting in the Myelomeningocele Patient

Mircevski, M.; Mircevska, D.: Long-Term Study in Surgically Treated Children with Encephalocele Synapticis

Katona, F.; Balázs, M.; Berényi, M.; Szabados, P.: Value of Early Rehabilitation following Operations in Hydrocephalus and Spina Bifida Infants

10.00–10.15 Coffee break

10.15–12.15
Scientific Session II (8 long papers)
Chairmen: J.F. Hirsch, A. V. Ciurea


Sato, O.; Ohya, M.; Tsugane, R.: Periventricular Lucency in Hydrocephalus and Its Relationship to Regional Microcirculation

Sklar, F.H.; Linder, M.; Diehl, J.: Significance of Postshunt Ventricular Asymmetries

Simennitsky, B.P.; Sherbakova, E. Ya.; Nikolskaya, O.E.: Surgical Treatment of Obstructive Hydrocephalus in Infancy and Early Childhood by Shunting without Valve


Dietrich, U.; Sakellariou, P.; Seibert, H.: Computertomographic Long-Time Results after Surgical Removal of Subdural Fluid Collections in Infancy and Childhood

Tsubokawa, T; Nakamura, S.; Moriyasu, N.: Effects of S-P Shunt on Subdural Hydroma with Subarachnoidal Effusion


12.15–13.15 Lunch

13.15–14.45
Scientific Session III
(11 short papers: 5 min presentation, followed by 3 min discussion)
Chairmen: H.J. Hoffman, K.H. Hovind

Macias, R.; Tena, L.: Myelomeningocele. New Technique for Skin Repair

McDevitt, N.B.; Gillespie, R.; Woosley, R.E.: Myofasciocutaneous Flap Closure of Large Thoracolumbar Myelomeningoceles

Passalis, K.; Katsonakis, G.: 1 Unusual Case of the Dandy-Walker Syndrome with Collapsed Cortical Mantle, Cystic Enlargement of Fourth Ventricle and Large Bilateral Subdural Effusions

Kanno, T.; Nakamura, T.; Supamoto, S.: A New Model of Experimental Hydrocephalus

Oberbauer, R.; Fritsch, G.: Macrocephaly: Clinical Evaluation and Indications for Surgery

Harmat, G.; Paraicz, E.; Szénasy, J.: Ultrasound Control of Progressive Hydrocephalus in Infancy

Longatti, P.L.; Fiore, D.; Zuccarello, M.; Gerosa, M.; Carteri, A.: Significance of Disproportionate Atroioccipital Dilatation in Congenital Hydrocephalus

Program for the Ninth Scientific Meeting

213

Netzeband, G.; Sturm, V.; Rommel, Th.: Stereotactic Ventriculocisternostomy in Aqueductal Stenoses of Infant Age

Dakrouy, I.; Lim, D.P.; Kazkaz, S.; Sprick, C: Valvulography as a Diagnostic Procedure in Cases with Value Function Disturbance
Mracek, Z.: Intracranial Hypertension Due to Enlargement of the Posterior Part of the Third Ventricle and Spontaneous Ventriculostomy: Clinical and Radiological Study
14.45–15.00 Coffee break
15.00–16.00
Scientific Session IV (4 long papers)
Chairmen: K. Sano, P. Paoletti
McLone, D.G.; Straw Killion, B.: Ventriculitis of mice and men
Loayza, P.; Zuleta, A.; Basauri, L.: ‘Compensated’ Hydrocephalus after Septic Ventriculitis
Ruggiero, R.; Palmieri, A.; Liguori, G.; Colangelo, M.; Ambrosio, A.: Prognostic Criteria in the Anoxic-Hemorrhagic Disease of the Newborn, Based on CT Scan Investigation
Paraicz, E.: Successful Treatment of Perinatal Intraventricular Haemorrhage
16.00–16.15 Coffee break
16.15–17.45
Scientific Session V (6 long papers)
Chairmen: /. Wocjan, O. Sato
Szénàsy, J.; Slowik, F.: Prognosis of Benign Cerebellar Astrocytoma in Children
Norris, D.; Bruce, D.A.; Schut, L.: Long-Term Prognosis of Medulloblastoma
Tyaworabun, S.; Kramer, H.H.; Lim, D.P.; Bock, W.J.: Cerebral Arteriovenous Malformations in Children: Clinical Analysis and Follow-Up Results
Bruce, D.A.; Schut, L.: Arteriovenous Malformations in Children
Program for the Ninth Scientific Meeting
214
Wednesday, July 22, 1981
8.00–10.00
Scientific Session VI (8 long papers)
Chairmen: H. Anderson, L. Schut
Kordas, ML; Balint, K.: Spinal Tumors in Childhood
Ori, S.; Raimondi, A.J.: Computerized axial tomography in Intraspinal Neoplasms of Infants and Children
Bhaygavi S.N.; Parulekar G.: Profile of Intracranial Space-Occupying Lesion in Children in India
Riccio, A.; Carols, F.; Carapella, M.; Occhipinti, E.: Primary Orbital Tumors in Children
Schut, L.; Bruce, D.: Orbital Dysplasias in Neurofibromatosis
10.00–10.15 Coffee break
10.15–11.45
Scientific Session VII (6 long papers)
Chairmen: A.J. Raimondi, L. Basauri
Nakamura, S.; Tsukokawa, T.; Moriyasu, N.: Cerebral Hemodynamics in Moyamoya Disease
Choux, M.; Yokota, A.; Lena, G.; Barbera, L.: Fibrosarcomas of the Dura in Children
Di Rocco, C.; Maira, G.; Borelli, P.: Pituitary Microadenomas in Children
Zidan, A.H.; Sorour, O.: Intracranial meningiomas of childhood and adolescence
Program for the Ninth Scientific Meeting
215
11.45–13.15
Scientific Session VIII (6 long papers)
Chairmen: F. Katona, A.H. Zidan
Eisenberg, H.M.; Levin, H.S.: Memory Deficit after Severe Closed Head Injury in Children
Pindaro, J.; Plese, P.; Machado de Almeida, G.: Anterior Fossa Floor CSF Fistulae: Surgical Treatment by Transethmoidal Approach
Mirceski, M.: Early Surgical Treatment of Traumatic Ethmoidonasal and Otogenic Liquoral Fistula

13.15–14.15 Lunch
14.15–16.15
Scientific Session IX (8 long papers)
Chairmen: D.G. McLone, G. Machado de Almeida
Rueda-Franco, F.; Santillan, F.: Intracranial Abscesses in Children. 41 cases in 10 Years
Kagawa, M.; Shinohara, T.; Yato, S.; Kida, H.: Brain Abscess Associated with Cyanotic Heart Disease in Children
Benes, V.: Sequels of Transcallosal Approach
Ivan, L.; Ventureyra, E.C.G.: Chronic Cerebellar Stimulation in Cerebral Palsy
16.15–16.30
Coffee break
16.30–18.30
Scientific Session X (15 short papers)
Chairmen: M. Choux, V. Benes
Haase, J.; Pedersen, C.; Brüncker, H.: Metastatic Hepatoblastoma: 10 Years’ Survival following Removal of Brain Metastasis
Oakes, J.; Bullitt, E.: Primary Intracranial Retinoblastoma
Scott, R.M.; Abramovitz, J.: Surgical Treatment of Pulsating Exophthalmos Secondary to Neurofibromatosis
Palma, L.; Russo, A.; Mercuri, S.: Cystic Cerebral Astrocytomas in Infancy and Childhood: Long-Term Results
Izquierdo, J.M.; Diaz De Tuesta, J.; San Esteban, F.; Coca, J.M.; Sarabia, R.: Embryonal Carcinoma of the Hypothalamic Region
Menzel, J.; Rommel, T.: On the Diagnosis and Treatment of Tumors and Colloid Cysts of the Third Ventricle in Children
Jezernik, M.: Intraventricular Meningeoma in a Child
Gazso, L.; Könya, E.: Culture Characteristics of Ependymomas and Medulloblastomas Occurring in Childhood
Rekate, H.L.; Fleming, D.; Shaffer, J.: Sleep Apnea as an Isolated Neurologic Sign Corrected by Cervical Stabilization
Ashby, J.G.; Bertram, E.G.: Why Trochlear (IV) Nerve Palsy is So Seldom Recognized
Oakes, J.; McLone, D.: Pain in Children with Spinal Cord Tumors
Walker, M.L.; Myers, G.G.; Madsen, P.; Smith, A.: Hemispherectomy in Childhood
18.30
Conclusive remarks: E. Paraicz

Abstract

217
1 Ventriculographic and Cisternographic Studies Using Water-Soluble Contrast Media in Infants with Myelomeningocele
Hiroshi Yamada, Shigetoshi Nakamura, Yuh Tanaka, Naoki Kageyama, Nagoya, Japan
The possible causes of hydrocephalus in 65 newborn infants with myelomeningocele were investigated by water-soluble contrast-media ventriculography, and 20 infants were studied by metrizamide myeloencephalography and computed tomography (CT) cisternography. The lateral ventricular dilatation was seen in 54 cases (83%). The Sylvian aqueduct was patent in all cases as seen with ventriculography. In 7 cases (13%) complete obstruction in the fourth ventricle at the level of the foramen magnum was observed, in 29 cases (54%) delayed communication at the outlet of the fourth ventricle, and in 13 cases (21%) there was rather free communication between the ventricular system and the spinal subarachnoid space. The findings of metrizamide myeloencephalography and CT cisternography were suggesting that a partial block at the level of the ambient cisterns was present approximately in one third of the infants, but the passage of contrast medium at the foramen magnum was rather rapid in most cases. Our findings support the concept that the cerebrospinal fluid flow is reduced in several areas. However, the most important site for the pathogenesis of hydrocephalus was thought to be the lowest portion of the fourth ventricle.

2 Symptomatic Chiari Malformation in Infancy and Childhood
J. Oakes
Duke University Durham, N.C., USA
Within the past 2 years 9 infants and children aged 1 month to 12 years presented for clinical investigation because of neurological deterioration secondary to a Chiari malformation. These patients fell into three distinct clinical categories depending upon which neural structure at the craniocervical junction was predominantly affected (spinal cord, medulla, or cerebellum). Spinal cord symptomatology was seen in both patients with a type-1 Chiari malformation and syringomyelia was demonstrated in both. 2 additional patients with a type-2 Chiari malformation and clinical evidence of a progressive upper motor-neuron dysfunction in the lower extremities were also demonstrated to have syringomyelia. 4 infants with type-2 Chiari malformations presented with a stereotyped history and examination consisting of poor feeding, nystagmus, retrocollis, inspiratory wheeze, depressed gag response, and eventually a spastic quadraparesis.

A severe and progressive cerebellar presentation was seen in 1 patient with a type-2 Chiari malformation at 6 years of age. All 4 patients with primary medullary dysfunction and the single patient with a cerebellar presentation were found to have a tight extradural band indenting the dorsal neural structures at the level of Cl.

All patients were operated upon at the craniocervical junction. No mortality or irreversible morbidity was encountered. The operative technique and transient postoperative problems will be discussed.

Abstracts of the Ninth Scientific Meeting

3 Analysis of 111 Cases of Myelomeningocele
Norberto Mario, Lopez Ramos, Guillermo, Santiago Ajler.
Hospital General de Ninos Pedro de Elizalde, Castellar, P.B.A., Argentina
111 cases with spinal dysraphia were studied between 1969 and 1979 (16 myelomeningoceles and 95 myelo-encephaloceles); 99 of these patients were operated on and all of them had neurosurgical treatment. 5 had polimialformations, 1 a congenital cardiopathy, 2 kyphosis, 2 congenital luxation of the thigh and insufficient breathing, and filtering with signs of meningitis was present in the remaining 11 cases developed hydrocephalus and pioventriculitis; all these died before the age of 1 year. 4 prematures were registered, 2 neonatal icterus and 4 cyanotics. 83 myelomeningoceles and 16 meningoceles were operated. None of the meningoceles presented associated malformations, only 1 developed hydrocephalus and pioventriculitis. Of the myelomeningoceles, 34 developed hydrocephalus; 21 drainages and 11 suffered from pioventriculitis. Of the patients operated on, 30 had perfect gait 18 had discharge apparatus and 81 had paralysis. Kinesitherapy was applied on 52 patients, 25 had perfect gait, 10 had discharge apparatus and 18 had paralysis. 18 patients suffered from sphincteral incontinence, the rest (all meningoceles) could control their discharge, 66 had urinary infection treated with manual compression (60%), intermittent catheterization and antibiotics. The associated malformation found with greatest frequency was the congenital talipes equino varus (25).

Intellectual evolution was good in 44 cases, moderate in 27 and bad in 28. 40 died before 12 months of age, 13 between 12 and 24 months, the remaining 46 are still alive.

Conclusions: in Argentina, for social reasons, we must adopt an interventionist conduct in most cases. Nevertheless, we have improved life quality by applying a selective criteria of surgery treatment.

4 Impact of Early Shunting in the Myelomeningocele Patient
R.E. Woosley
University of North Carolina, Chapel Hill, N.C., USA

A prospective randomized study was carried out in myelomeningocele patients with hydrocephalus evidenced only by computerized tomography. Conventional treatment, repair of the back defect followed by a shunt placement when clinical hydrocephalus became evident, was contrasted with combined treatment, shunt placement followed by back repair at the same surgical sitting. The conventional group had a mean hospital stay of 32 days and the combined group 16.4 days. Operating and anesthesia time for the conventional group was 7.3 and 9.3 h, respectively, as compared to 6.4 and 8.0 h for the combined group. Estimated total blood loss was virtually the same for both groups. There were 2 CSF leaks, 2 neurotic suture lines, and an average of 0.9 shunt revisions for the conventionally treated patients. With combined treatment, there were no complications and a 0.7 average shunt revision. This data shows a significant difference in the length of hospitalization and the number of surgical complications of the combined therapy compared to conventional therapy.

Abstracts of the Ninth Scientific Meeting

219
5 Long-Term Study Encephaloceles Syncipitalis Surgically Treated Children
with M. Mircevski, D. Mircevska, Department of Surgery, Section of Pediatric Neuro Surgery, School of Medicine, Skopje, Yugoslavia

During the last 10 years we have observed and surgically treated 22 children with dysraphic anomalies in the syncipital region. The diagnostics included simple craniogram, gamma-cysternography, arteriography and pneumoencephalography. From time to time a CSF analysis was performed. During the last 3 years we have used computerized tomography, and concomitant complications of encephalocele syncipitalis can now be detected (hydrocephalus, porencephalic cysts, etc.).

Surgical treatment consisted of neurosurgical solution of encephalocele, and a plastic and reconstructive surgery of the face. In the presence of hydrocephalus, as a first step a ventriculo-or cysto-auriculostomy is performed. Results of surgical treatment are satisfactory and intra-or post-operative mortality was not present.

6 Value of Early Rehabilitation following Operations in Hydrocephalus and Spina Bifida Infants
F. Katona, M. Balázs, M. Berde, P. Szabados
Department of Developmental Neurology and Neurohabilitation, Pediatric Institute Szabadághegy, Budapest, Hungary

Various diagnostic batteries were applied in newborn and young infants with meningocele and hydrocephalus to establish a pre-operative diagnosis. The integrity of sensory function feeding-visu-auditive behaviour was studied by polygraphy, and exteroceptive stimulation. Sensori-motor organisation, posture and distribution of muscle tonus were investigated by the activation of elementary motor patterns and occasional polygraphy. Vegetative
innervation was assessed by electrourodinamics and rectography. This methodology proved to be a solid basis to compare pre- and post-operative states and the necessity of early, immediate rehabilitation. The scope of rehabilitation extended from regular sensorimotor therapeutic training programs, completed by electrotherapy, to visual, acustic stimulation programs, stereophonic hearing aid and motivational programs. The correlation of neurosurgery and early rehabilitation brought the best results in the treatment of infants, when the brain damage effected the development of the central nervous system before the neurosurgical operative intervention. In these cases delay of early appropriate rehabilitation may increase the risk of defective brain development even in the case of successful operation.

7 Hydrocephalus Associated with Arachnoid Cyst

H. Nogaki, K. Fujita, N. Tamaki, K. Ishida, S. Matsumoto
Department of Neurosurgery, Kobe University School of Medicine, Kobe, Japan

Hydrocephalus associated with arachnoid cyst in infancy and childhood was reviewed. In the present 9 cases, membranes of arachnoid cysts were all histologically composed of arachnoid cells.

Abstracts of the Ninth Scientific Meeting

220

Developmental retardation and enlarged head circumferences were common features on admission. Localized neurological findings such as hemiparesis and asymmetry of the skull were noted only in middle cranial fossa arachnoid cysts. On the other hand, signs of increased intracranial pressure were recognized in midline-sited cysts.

4 patients had arachnoid cysts in the middle cranial fossa, which were all located on the left side. Other sites involved were the quadrigeminal cistern, retrocerebellar cistern etc. Computed tomography cisternography with Metrizamide was very useful to study the communication between arachnoid cyst and subarachnoid space or ventricular system.

Pathogenesis of hydrocephalus revealed the obstruction of cerebral aqueduct or the outlet of the 4th ventricle in 5 of 9 patients, which were all located in the midline or posterior fossa. 2 patients had large arachnoid cysts extending from the middle cranial fossa to the cerebral convexity. In these patients diffuse subarachnoid block of cerebro-spinal fluid circulation was suggested. Etiology of hydrocephalus was unknown in an other 2 patients.

We have performed membranectomy as much as possible and cyst-peritoneal shunt with low pressure system for arachnoid cysts. For hydrocephalus, ventriculoperitoneal shunt was done in all but 1 patient.

Pathogenesis and surgical therapy of hydrocephalus associated with arachnoid cyst were discussed.

8 Periventricular Lucency in Hydrocephalus and Its Relationship to Regional Microcirculation

O. Sato, M. Ohya, R. Tsgane, Neurosurgery, Tokai University, Isehara, Japan

Purpose: Considering that periventricular lucency (PVL) seen in hydrocephalus is caused by the forced cerebrospinal fluid transit through the ependyma, PVL at times could be an important factor which influences its preference of treatment. This report deals with the relationship between PVL and the changes in regional microcirculation.

Method: Adult mongrel dogs and puppies were made hydrocephalic with cisternal injection of kaolin suspension. CT scans were repeated every week and at the termination of the experiment the brain was perfused with colloidal carbon or microbarium. Histological investigation and soft X-ray films provided the study comparing the deranged circulation and its microvasculature with PVL on CT scan.

Result: Ischemic changes were most prominent at 2 weeks after kaolin introduction and these showed some improvement when observed for a longer period; however, well-demarcated ischemic infarctions were demonstrated particularly in the dorsolateral angle of the lateral ventricle where changes of capillaries were most marked. Various degrees of changes were also revealed even in the area which was not affected a infarction. Interestingly enough infarctions were rarely observed in puppies, in spite of its definite ventricular dilatation.

Conclusion: These studies have demonstrated a close relationship of the changes described above and the changes exhibited on CT scan. Impaired microcirculation is now believed to play an important role in the pathology of hydrocephalus along with increased intracranial pressure and edematous changes of the parenchyma.

Abstracts of the Ninth Scientific Meeting

221

9 Significance of Postshunt Ventricular Asymmetries

Frederick H. Sklar, Martin hinder, Jan Dietl
Divisions of Neurological Surgery (Pediatric Neurosurgery) and Neuroradiology, University of Texas Health Science Center at Dallas, Dallas, Tex., USA

We have noted that the elasticity slope relating the natural logarithm of pressure to volume during rapid subarachnoid infusions is proportional to ventricular size. It follows that patients with large ventricles have greater intracranial pulse amplitudes than do patients with small ventricles and that these pulse differences are accentuated at graded levels of intracranial hypertension. Whether the elasticity changes are the cause or the result of the ventriculomegaly is adressed. Right and left ventricular areas from pre- and postoperative CT scans were measured with a computer-digitizing technique, and the respective areas were expressed as a ratio. Measurements were made from the scans of 13 hydrocephalic children selected at random. Ages at surgery ranged from 2 weeks to 10.5 years. The time interval between surgery and the postoperative scan ranged from 1 to 124 weeks. The results indicate a significantly greater decrease in ventricular size on the side of the ventricular shunt catheter (p <0.05, matched pairs signed rank test of Wilcoxon). Multiple regression analysis shows no significant relationship between the magnitude of the change in ventricular size and either or both the patients’ ages or the time intervals between surgery and follow-up scan.

Pressure pulsations within the ventricle with the shunt catheter were likely dampened by the displacement of a small volume of CSF into the ventricular catheter with each cardiac cycle. We suggest that the shunt, therefore, functioned as a shock absorber, resulting in a lower P-V elasticity slope on the side with
the ventricular catheter. That the shunted ventricle is significantly smaller indicates that the elasticity changes may indeed be important as a causative factor in the evolution of communicating hydrocephalus.

10 Surgical Treatment of Occlusive Hydrocephalus in Infancy and Early childhood by Shunting without Valve
B.P. Simonenitsky, E. Ya. Sherbakova, O.E. Nikolskaya Burdenko Institute of Neurosurgery, Moscow, USSR
At present the majority of surgeons uses the valvular drain systems in the treatment of hydrocephalus in early childhood. These systems lead CSF out of the liquor spaces to the right arience, peritoneal or pleural cavity. The advantages of these systems are their usage at any type of hydrocephalus, low traumatism and the ability to keep the definite level of the liquor pressure. But valvular drains have some drawbacks. First of all the necessity of the repeated interventions to lengthen the shunts with the growth of a child. The operations on the valvular shunt implantation require a special operating-room with roentgen control and the valvular shunts are not always available. The occlusive hydrocephalus may be successfully treated without any valvular shunts using the Torkildsen operation. But its efficiency is low in infancy and even for 3-year-old children, and it causes a great number of complications. We studied the liquor spaces in children with occlusive hydrocephalus under 3 years of age with the cister-noscintigraphy after the endolumbal introduction of Tc-DTPA or In-DTPA. In all children pneumoencephalography was performed. There were two types of radiopharmepreparation (RPhP) distribution. The first type was characterized by rapid distribution of the preparation (during 1 h) to the basal cisterns and its evacuation into blood in 6 h. This type was typical for the children under 1 year of age. The second type was marked by the holding of RPhP in the basal cisterns for more than 24 h. It was typical for the children aged between months and 3 years. At any type there was no RPhP exit to the subarachnoid space of the parasagittal region. The results proved the earlier publications where the disappearance of the subarachnoid spaces over the convex surface of the hemispheres at the prolonged and distinct hydrocephalus is shown. This makes liquor resorption difficult and explains the unsatisfactory results of the Torkildsen operation at the occlusive hydrocephalus in infancy. We combined the Torkildsen operation and lumboperitoneal shunt without any valve in 24 children with occlusive hydrocephalus to provide the liquor resorption. There were 16 children under the age of 1 year and 8 children aged between 1 and 3 years. In 3 children in the latter (older) group hydrocephalus was due to a third ventricle tumor. The post-operation period lasted from months to 4 years. 20 children (83,3%) showed stabilization of hydrocephalus, 1 patient required lumboperitoneal shunt revision, and one had ventriculostriatral shunt because of the adhesive process in the abdominal cavity. 3 patients died (1 subdural haematoma, 1 status thynmo-lymphaticus, 1 haemorrhage into the third ventricle tumour). The combination of the Torkildsen operation with lumboperitoneal anastomosis is recommended for occlusive hydrocephalus in infancy.

11 Suprapineal Ventriculostomy: An Exit from the Shunt
A. Hirayama, S. Noda, T. Kokunai
Department of Surgical Neurology, Awaji District General Hospital, Awaji, Japan
This paper presents a safer method of third ventriculostomy as a shunt alternative to shunt-dependent slit ventricles and obstructive hydrocephalus in human based on the animal experiment reported by the authors in 1979. By using a traditional supratentorial craniotomy for the pineal region, the Galenic vein was identified in the quadrigeminal cistern by microscope. By opening the suprapineal recess with a bipolar coagulator, pulsation of CSF which is supposed to prevent postoperative adhesion was clearly recognized together with a part of the choroid plexus of the third ventricle. 12 patients (9 posttraumatic and 3 shunt-dependent slit ventricle) with obstructive hydrocephalus had this operation performed on them on a non-emergency basis. All of them were alive in the follow-up period ranging from 2 months to 3 years. Sequential CAT scans showed reasonable trends towards normalization of the CSF space. 3 cases of shunt-dependent slit ventricles experienced occasional vomiting and drowsiness for a few weeks after operation; however, they did get rid of the slit ventricles with the aid of supplementary administration of steroids and dehydrators. Possible mechanisms of re-establishment of the physiological flow of CSF will be discussed together with the further indication of this operation.

12 Computertomographic Long-Time Results after Surgical Removal of Subdural Fluid Collections in Infancy and Childhood
U. Dietrich, P. Sakellario, H. Schiert, Department of Neurosurgery (Director: Prof. Dr. W.J. Bock), University of Düsseldorf, FRG
In 53 cases late computertomographic results could be gained 3-8 years after surgical removal of subdural fluid collections in infancy or childhood (average 8.5 years postoperatively). The result was normal in only 3 cases and reaccumulation of subdural fluid was found twice. The most common finding was dilatation of external and internal liquorous spaces. Unilateral dilatation was found more often than bilateral symmetrical, and 1 case even showed a contralateral hemiatrophy. Differentiation from normal pressure hydrocephalus can be supported by computed tomography. But in contrast an abnormal computertomographic finding does not mean a bad clinical condition. No correlation could be found between etiology, method of operation, intraoperative finding and duration of symptoms to abnormal computertomographic findings. It seems that the subdural collection itself leads to compression and atrophy of underlying brain substance.

13 Effects of S-P Shunt on Subdural Hydroma with Subarachnoidal Effusion
Takash Tsubokawa, Saburo Nakamura, Nobuo Moriyasu
Department of Neurological Surgery, School of Medicine, Nihon University, Tokyo, Japan
62 cases of subdural hydroma (less than 1 year old) were treated according to CT findings. 10 of them had both subdural hydroma and subarachnoidal effusion which were treated by S-P shunt with partial arachnoidecotomy. The effects of S-P shunt on these cases should be classified in to new pathological entities and be differentiated from subdural hydroma by both repeated CT findings and clinical courses.
Initial symptoms of these shunts are enlargement of the head or seizures. The CT findings are seen bilaterally from the parietal crescent low density area with moderate ventricular enlargement, wide cerebral sulci, enlarged Sylvian cistern and widening of interhemispheric fissure. Subarachnoidal blocking is observed by RSA cisternography in all cases. During the 4 months following S-P shunt, there are no more atrophic findings and crescent low density areas, except in 3 cases who have craniocerebral disproportion. However, normal psychomotor development was observed in only 2 cases (20%), in spite of decrease of atrophic findings of the brain by repeated CT findings in follow-up results. According to this clinical analysis of subdural hydroma with subarachnoidal effusion these cases might be differentiated from so-called subdural hydroma.

14 Local Fibrinolysis in Chronic Subdural Hematomas in Infancy
J.A. Alvarez-Garijo, J.J. Vilches, M. Vila, D. Taboada
Pediatric Neurosurgery, Children’s Hospital La Fé, Valencia, Spain
Local fibrinolysis has been proposed as a main factor in the maintenance of chronic subdural hematomas. During the last 3 years we have investigated the local fibrinolytic activity in 19 patients aged from 2 to 10 months suffering from chronic subdural hematoma, which was bilateral in 12 cases. 6 of them were posttraumatic, 5 postmeningitis, 3 due to dehydration, 2 not properly treated acute subdural hematoma of neonate, 2 of no determined origin and 1 was the result of shunt insertion in a monoventricular hydrocephalus. The diagnosis was established by neuroradiological methods, angiography in former patients and CT scan in the last 6.

Fibrinolytic activity was determined in both systemic blood and subdural fluid by means of dosage of levels of fibrin split products (FSP) by the method of agglutination on latex particles. Coagulation in systemic blood and chemical and cytologic characteristics in subdural fluid were studied in all patients. In 16 patients (25 collections) dosage of FSP was positive with levels ranging from 10 to 640 µg/ml. Hematomas of different FSP levels in the same patient were found in 4 cases. In 2 of them, having bilateral collections, demonstrable fibrin-olysis was unilateral. In 3 patients (4 collections) dosage of FSP was negative in subdural fluid, 2 of them with a protein concentration in this fluid of 270 and 520 mg/100 ml, respectively. Coagulation studies were normal in all patients. In 3 patients without demonstrable local fibrinolysis, cure was achieved with no more treatment than the first subdural puncture, but an other case with unilateral negative dosage of FSP had a bad evolution with persistent hematomas. The 16 patients with demonstrable local subdural fibrinolysis had a different course, 12 of them treated by repeated evacuations and FSP monitoring by means of a ventriculo-lostomy reservoir inserted in each collection. The results confirm that local fibrinolysis is a frequent phenomenon in subdural hematomas, not related with systemic clotting alteration nor with subdural fluid appearance and protein contents. The results suggest that fibrinolysis is a factor in the maintenance of chronic hematomas, but not the uninc factor, not even the main factor.

15 Myelomeningocele. New Technique for Skin Repair
R. Macias, L. Tena
Hospital Infantil, Morelia, Mich, Mexico
This is a description of a useful technique for skin repair in medium-size lumbar or lumbosacral myelomeningoceles. It consists of the displacement towards the midline of two lateral triangular flaps located on each side of the lesion. This technique has been used to cover skin defects in other regions of the body, but not in lumbar region myelomeningoceles. The results are encouraging.

16 Myofasciocutaneous Flap Closure of Large Thoracolumbar Myelomeningoceles
N.B. McDevitt, R. Gillespie, R.E. Woosley University of North Carolina, Chapel Hill, N.C., USA
Early closure of large thoracolumbar dysraphic defects can be accomplished in one stage as a combined neurosurgical and plastic surgery procedure using myocutaneous flaps based on the latissimus dorsi together with extended gluteal fasciocutaneous flaps. The importance of this new technique is that it allows the interposition of a well-defined myofascial structure between the skin and dura while advancing the skin together with its perforating blood supply in both the superior and inferior aspects of the flap thereby decreasing the chance for skin breakdown.

225 Formerly at our institution, cases requiring extensive rotational or flap transfer were closed using sliding bipedicled skin flaps. Because these frequently demonstrated transient but worrisome vascular compromise, we have employed the present technique in repair of our last six large thoracolumbar defects. Wound healing has been satisfactory in all cases, and none have experienced deterioration of preoperative neurologic function. The technique of mobilization of this flap with identification and preservation of its blood supply will be illustrated.

17 Unusual Case of the Dandy-Walker Syndrome with Collapsed Cortical Mantle, Cystic Enlargement of Fourth Ventricle and Large Bilateral Subdural Effusions
K. Passalis, G. Katsourakis
Diagnostic and Therapeutic Center Hygeia, Athens, Greece
The way of management of a 12-year-old boy suffering from the Dandy-Walker syndrome and the author’s preference in regard to the materials used and the technique for the shunting procedure are described. Slides will be presented.

18 A New Model of Experimental Hydrocephalus
T. Kanjo, T. Nakamura, S. Sugimoto
Department of Neurosurgery, Fujita-Gakuen University, Toyoake, Japan
A new experimental model of a communicating hydrocephalus was made by transplant-tating human originated glioma cells and HeLa cells into a C-57 Black mouse brain.

Method: 10^6/ml of the cells were innoculated into the right temporal brain of 10-day-old C-57 Black mice. About 2 weeks after the innoculation, the hydrocephalus developed.
Results: (1) 13 out of 58 C-57 Black mice developed the hydrocephalus after the transplantation of human originated glioma cells. (2) 1 out of 10 C-57 Black mice developed the hydrocephalus from the transplantation of HeLa-S3 cells. (3) No hydrocephalus developed after the homogenous transplantation (eg., transplantation of RG 6-6 cells which originated from glioma of Wistar rats into Wistar rats). This hydrocephalus developed only by the heterologous transplantation. (4) No transplanted cells were observed in the brain of mice when the hydrocephalus developed. (5) No obstruction was seen in the CSF pathway. (6) Scattered lymph cells were observed in the brains.

Conclusion: Although the causal genesis of this development of hydrocephalus still is unknown, the reject reaction against the heterologous transplantation may be the cause of this hydrocephalus.

19 Macrocephaly: Clinical Evaluation and Indications for Surgery
R. Oberbauer, G. Fritsch
Neurosurgical and Pediatric Department, University of Graz, Austria
The clinical feature of macrocephaly can be evaluated easily since the invention of CT scan. Whereas in the majority of cases, CT diagnosis results in undoubtful indication for
Abstracts of the Ninth Scientific Meeting
226 surgery, a minor group of macrocephalic infants remains with either slightly enlarged ventricles or external hydrocephalus or both. Refferring to the latter group, 22 patients with macro-cephaly were treated without operation. Follow-up results (1977–1980) revealed normal development in 6 patients with normal CT, but only 2 out of 10 with pathologic CT findings (as described above).
Conclusively, repeated CT studies alone do not appear sufficient in macrocephalic infants with either slight ventricular enlargement and/or external hydrocephalus, but no clinical signs of raised intracranial pressure. Further evaluation with continuous ICP monitoring and isotope studies seem to be advisable. Results are discussed in detail.
20 Ultrasound Control of Progressive Hydrocephalus in Infancy
G. Hartmann, E. Parácek, J. Šenášay
The Mádárazs-str. Hospital for Sick Infants and Children of the Council of Budapest, National Scientific Institute for Neurosurgery, Budapest, Hungary
In a clinical viewpoint, in infantile hydrocephalus the cardinal issue is progression or arrest. Clinical examination included measurement of cranium circumference which only showed the disease in an advanced state. In suspicious cases pneumoencephalography and iodine ventriculography can be conducted but these are invasive and dangerous. CT scanning is recent and satisfactory but operates with X-ray. Most recently, ultrasound results have been encouraging. Among neonates and infants, the latest real-time and gray scale compound scanings provide certain spatial results equal in value to CT scanning, which can be repeated readily, while instrumentation is significantly less costly and more mobile. The examinations were conducted with real-time sector scanning and gray scale compound scanning techniques using Brüel and Kjaer scanners (3401 and 3402). The anterior fontanelle and sutura are suitable for such examinations of the cranial cavity and cerebral structure. The cerebral ventricular systems and structures of 120 premature, neonate and older infants were examined. The pictures showed a good coincidence with anatomical structure and earlier examination methods. In meningomyelocele infants postsurgery follow-up was conducted to determine progression or arrest. Where progression was found, this was an indication for introducing the shunt. This was also the first step taken in examining macrocranial infants and other intracranial abnormalities (synoventriculosis, cerebral agenesia, etc.). Causes other than hydrocephalus can also be diagnosed.
21 Significance of Disproportionate Atriooccipital Dilatation in Congenital Hydrocephalus
P.L. Longatti, D. Fiore, M. Zuccarello, M. Gerosa, A. Carteri
Sezione die Neurochirurgia Infantile, Istituto di Neurochirurgia, Università di Padova: Servizio di Neuroradiologia, Ospedale C. di Padova, Italia
Disproportionate atriooccipital ventricular dilatation is not an uncommon aspect of hydrocephalus in children. In a series of 45 CT scans performed in hydrocephalic infants we could observe a significant occurrence of the abovementioned feature in the cases of congenital hydrocephalus. The possible explications are discussed particularly in relation to the fact that the damage in the atriooccipital portion of the brain could be nonregenerative more than atrophic. The earliest surgical management of these cases is further supported by the hope that the relief of the pathological ICP could permit the residual maturative chances of the brain in the first postnatal period.
22 Stereotactic Ventriculocisternostomy in Aqueductal Stenoses of Infant Age
G. Netzeband, V. Sturm, Th. Rommel, O. Pastyr
Neurosurgical Department, Surgical Center of the University, Heidelberg, FRG
In cases of noncommunicating hydrocephalus with intact CSF absorption, stereotactic ventriculocisternostomy proved very valuable in restoring physiologic CSF circulation. Nevertheless the method has a relatively high recurrence rate. The main problem is to keep the opening between 3rd ventricle and basal cisterns permanently patent. We report about a new instrument developed by us with which we can perform a reliable stereotactic ventriculocisternostomy. The clinical and radiographic results will be shown.
23 Valvulography as a Diagnostic Procedure in Cases with valve Function Disturbance
I. Dakroury, D.P. Lim, S. Kazkaz, C. Sprick
Neurosurgical Department of Düsseldorf University, Düsseldorf, FRG
The postoperative follow-up studies of shunt-treated hydrocephalic children by means of computerized axial tomography, echoencephalography and plain films of the skull, chest and abdomen are of great diagnostic value. Valvulography as a diagnostic procedure in cases with valve function disturbance provides...
a reliable representation of the size and extent of cerebrospinal fluid and the possible pathological changes of brain parenchyma. Valvulography offers valuable data on the continuity and correct position of the shunt system. The experience gained by this method in our Neurosurgical Department will be discussed.

24 Extracorporeal Measurement of CSF Flow in the Shunt Tube
M. Hara, Y. Konishi, T. Sakai, M. Numoto, K. Takeuchi
Department of Neurosurgery, Kyorin University School of Medicine, Kyorin, Japan
An implantable device for measurement of CSF flow in a shunt tube has been developed. The unit is energized by an extracorporeal high frequency generator and bubbles are created in the shunt tube by electrolysis. The bubble flow velocity in the tube is measured by a pair of ultrasonic Doppler probes placed apart on the skin surface and in parallel with the tube. The CSF flow is expressed in milliliters per hour by calculating both velocity and tube diameter. In animal experiments, the device can measure flow rates of 2–60 ml/h. Some clinical cases using the flowmeter are presented.

Abstracts of the Ninth Scientific Meeting

228
25 Intracranial Hypertension Due to Enlargement of the Posterior Part of the Third Ventricle and Spontaneous Ventriculostium: Clinical and Radiological Study
Z. Mracek
Department of Neurological Surgery, Faculty of Medicine, Charles University, Prague, Czechoslovakia
Three cases of aqueduct stenosis due to enlargement of the diverticulum of the 3rd ventricle and/or with subtentorial cyst formation are reported. This infratentorial fluid-containing cavity, the so-called spontaneous ventriculostium, is situated in the midline between the cerebellum and the tentorium cerebelli and may cause a compression of the brain stem. The interrelationships between aqueduct stenosis and extension of the diverticulum of the 3rd ventricle through the tentorial notch are discussed. The radiologic features, both ventriculographic and angiographic, are reviewed.

26 Ventriculitis of Mice and Men
David G. McLone, Beth Straw
Kennon Children’s Memorial Hospital, Chicago, IL, USA
Between 2 and 5% of shunt procedures will result in ventricular infections in hydrocephalic children. It is now clear that this complication of the shunt procedure is the major cause of retardation in these children.

In order to study possible mechanisms involved in ventriculitis leading to cerebral injury, we developed a murine model. Catheters contaminated with known concentrations of Staph. aureus, Staph. epidermidis and E. coli were inserted into the ventricles of normal and hydrocephalic animals from two different strains of mice. Tissue was then prepared for light and electron microscopy from 122 animals. Factors leading to a higher rate of infection, parenchymal damage, and mortality in the mice were: (1) altered immunity, (2) increasing concentration of contamination, and (3) hydrocephalus. E. coli was more devastating than Staph. aureus and both were worse than Staph. epidermidis. The infection spread along the ventricular pathway and the white fiber tracts of the brain – not the shunt tract. Loculated ventricles are probably the result of the coalescences of extra-ventricular cysts. The ventricular wall is a strong barrier to spreading infection unless it is disrupted by the shunt.

27 ‘Compensated’ Hydrocephalus after Septic Ventriculitis
P. Loayza, A. Zuleta, L. Basaur
Instituto de Neurocirugía, Santiago, Chile
In a group of 15 cases of hydrocephalus with secondary ventriculitis treated with external ventricular drainage (EVD) and monitoring of intraventricular pressure at our institution in the last 3 years, 7 patients ‘arrested’ or ‘compensated’ the hydrocephalus. Age ranged between 2 months and 24 years, 5 were men and 2 women. 1 patient developed ventriculitis during the postoperative period of a treated myelomeningocele and 2 were secondary to a ventriculocisternostomy. Of the 4 V/P shunts, in 1 case the infection corresponded to a colonization and 3 were intra-operative. All the patients were treated with EVD and antibiotics.

Abstracts of the Ninth Scientific Meeting

229
28 Prognostic Criteria in the Anoxic-Hemorrhagic Disease of the Newborn, Based on CT-Scan Investigation
R. Ruggerio, A. Palmieri, G. Luguirri, M. Colangelo, A. Ambrosia Neurosurgical Department, Children’s Hospital Santonono, Naples, Italy
Intracranial bleeding and/or bloodless strokes at the time of birth or before birth may be followed by a variety of cerebral abnormalities. Recently, these lesions have come increasingly into the purview of the neurosurgeon thanks to the CT scan investigation, which allows to estimate the causes, types and neurologic sequelae of such cerebrovascular accidents. The pathological findings consist, during the acute phase, of pereventricular leukomalacia, ischemia, hemorrhage which may produce, secondarily, cerebral atrophy, porencephaly, hydrocephalus. This report is based on more than 100 cases of newborns with neurological complaints at the time of birth. In all instances CT scan was carried out, as early as possible, in defining the primitive pathological features and, subsequently, several CT scan investigations were performed within the follow-up studies. The significance of the work is devoted to assess, in the case of the anoxic-hemorrhagic disease of the newborn, some degrees of prognostic criteria, based on the pathological involvement and the subsequent clinical feature.

29 Successful Treatment of Perinatal Intraventricular Hemorrhage
E. Paraicz
State Institute of Neurosurgery, Budapest, Hungary
25% of the perinatal mortality is due to ventricular hemorrhage. Almost all patients are lost during the perinatal period. The intraventricularly accumulated blood coagulates at the outlet of the ventricular system or at the intermeningeal spaces, thereby evaluating an ICP hypertension with increasing respiratory disturbance, acidosis, and ultimately reduced cerebral blood flow causing a hopeless condition.
The possibility of successful treatment is principally based on: (1) the improvement of PIC and respiratory therapy (the process occurs in premature infants and the coincidence with hyaline membrane disease); (2) the use of continuous external drainage of CSF spaces recommended by Kusske, Wise and our team. A silicon catheter onto the frontal horn of the lateral ventricle through a transcutaneous fontanellar tap was introduced. The fluid was received in a sterile reservoir through a sterile tube. The pressure level in the system was about 100 mm H2O. The drainage was maintained for several days or 1–2 weeks, until the bleeding in the ventricles stopped.

The advantages of this method are: (1) the development of high ICP may be avoided and the genesis of serious impairments of brain function prohibited; (2) the majority of the hemorrhage is evacuated, the danger of intermeningeal block diminishes, the functional capacity of the absorptive surfaces remains intact, and (3) because the blood does not coagulate in the organism, no blood clotting factors are mobilized, the danger of DIC is diminished. The functional results in a series of patients are fairly good.

30 Prognosis of Benign Cerebellar Astrocytoma in Children
J. Szénásy, F. Slowik
National Institute of Neurosurgery, Budapest, Hungary

A total of 137 operated benign astrocytoma cases are analyzed in this retrospective long-term follow-up study. All patients were under the age of 14 at admission and all surgical interventions were undertaken in our institute between 1954 and 1975. Follow-up was terminated in 1980. Histological findings were reassured and classified with special respect to the tumor invasive nature and malignity. Localization, extension of the tumor and possible leptomeningeal infiltration were also considered. Clinical information of prognostic value can be extracted from the correlative analysis of morphological findings and the outcome as measured on the frequency rate of recurrences and the survival time.

31 Long-Term Prognosis of Medulloblastoma
D. Norris, D.A. Bruce, L. Schut
Children’s Hospital of Philadelphia and University of Pennsylvania School of Medicine, Philadelphia, Pa., USA

Between 1969 and 1979, 22 patients with medulloblastoma were treated by the same surgical group and radiation therapy group. The patients were divided into two groups because of the clinical availability, in December of 1974, of the computerized tomography scanner and the operating microscope used in the initial surgical procedure. There were 11 patients in each group. Relapse-free survival in the group treated between 1969 and 1974 (group I) was 38% at 4 years. The survival in the 11 patients treated between 1974 and 1979 (group 2) was 84% at 4 years. This improvement is statistically significant (p 0.001). All patients received the same dose of radiation.

Efforts to minimize tumor burden at diagnosis by total surgical resection did not increase postoperative morbidity or mortality. These results will be discussed along with the relative impact of the CT scan, total resection at surgery, and increased focus for radiation therapy on the improved outcome. Results using adjunctive chemotherapy will be discussed.

32 Intracranial Ependymomas in Children: A Review of 39 Cases
Service de Neurochirurgie, Hôpital des Enfants Malades, Paris, France

In intracranial ependymomas, should the whole axis be irradiated, as is presently performed in medulloblastomas? To answer this question, a series of children less than 13 years old was reviewed. There were 11 supratentorial and 28 infratentorial ependymomas, treated by surgery and radiotherapy, from 1969 to 1979. In these cases, radiotherapy was delivered exclusively to the cerebral hemispheres in supratentorial ependymomas, to the absopment of the Ninth Scientific Meeting 231 whole brain in infratentorial ependymomas, and to only the posterior fossa when the tumor was infratentorial in children less than 2 years old. In this series a complementary prophylactic spinal radiotherapy was completed only in 1 patient. The overall postoperative mortality for this series was 15.3%; in supratentorial ependymomas 9%, in infratentorial ependymomas 18%. Survival rates at 3 and 5 years were 45 and 36%, respectively. The principal prognostic factors were: (a) histological grading: two thirds of the survivors had been operated for a benign ependymoma while 9 out of the local recurrences or metastases were found in the group with malignant ependymomas; (b) tumor site: supratentorial ependymomas did not show any metastasis in the posterior fossa or spinal axis, whereas secondary spinal lesions occurred in 18% (4 cases: 3 malignant, 1 benign) of the infratentorial ependymomas. Remarkably in these 4 cases, it was impossible to demonstrate, clinically and by scan, any recurrence in the posterior fossa at the time of metastasis. This study and a review of the literature strongly suggest that, in malignant ependymomas, radiotherapy should be delivered to the whole craniospinal axis. In benign supratentorial ependymomas, radiotherapy could be limited to the tumoral site and the cerebral hemispheres. In benign infratentorial ependymomas, the posterior fossa and the spinal axis should be irradiated.

33 ICNG Trial on Malignant Brain Tumors in Children: Current Survey
S. Pezzotta, G. Butti, R. Knorich, P. Paoletti Neurosurgical Clinic, University of Pavia, Pavia, Italy

During the past decade approximately 35 and 25% of the children with medulloblastomas who underwent major surgery and CNS irradiation have had 5- and 10-year survival rates, respectively. The effectiveness of adjuvant chemotherapy in medulloblastoma and malignant ependymoma in childhood is unclear. The Italian Child’s Neurooncology Group (ICNG), a multicenter study group founded in 1979, designed a prospective, controlled and randomized trial to compare the efficacy of CCNU, VCR and PCZ combined versus CCNU and VCR in medulloblastoma and malignant ependymoma in children after surgery and radiotherapy (RT). This protocol was started in January 1980 and is still open to randomization. All patients undergo surgery and RT (3,500 ± 1,000 rad to the craniospinal axis and 5,500 rad to the posterior fossa). Chemotherapy for the control group consists of CCNU, (120 mg/m2 p.o. on day 1) and vincristine
(VCR; 1.0 mg/m² i.v. weekly during RT; 1.5 mg/m² i.v. on day 1, 8 and 15 in subsequent courses). The patients in the second group are given the same treatment as above plus procarbazine (PCZ; 100 mg/m² p.o. from the 8th to 21st day of every subsequent chemotherapy course). The course of chemotherapy is repeated every 8 weeks. The drug dose is reduced if toxicity develops. The response to treatment is evaluated using neurological examinations, Karnofsky ratings and CT scans.

To date 20 patients, ranging from 13 months to 13 years of age, have entered the study. Each group of this protocol has 10 patients. CT findings, response rates and survival will be presented.

Abstracts of the Ninth Scientific Meeting

232
34 Cerebral Arteriovenous Malformations in Children: Clinical Analysis and Follow-UpResults
S. Tiya, R. Corbally, H.H. Kramer, D.P. Lin, W.J. Boek
Neurosurgical Department and Neuropediatrics Division, Düsseldorf University Hospital, Düsseldorf, FRG

During the past 15 years, 240 cases of cerebral arteriovenous malformations have been seen and treated in our department. Among these 33 patients were children under the age of 18 years. The clinical manifestation, neuroradiological examinations, conservative and surgical treatment as well as long-term follow-up results form the subject matter of this communication. With the introduction of computerized tomography this lesion can be properly diagnosed and thus surgical intervention can be done, especially in cases with angio-graphic cryptic vascular malformations.

35 Arteriovenous Malformations in Children
Derek A. Bruce, Luis Schut
Children’s Hospital of Philadelphia and University of Pennsylvania School of Medicine, Philadelphia, Pa., USA

Between 1975 and 1980 32 children with AVM (mean age 8.5 years) have been treated at the Children’s Hospital of Philadelphia. 16 were in the cerebral hemispheres (9 on the left, 7 on the right), 5 were in the corpus callosum or deep to it, 5 were in the posterior fossa, 3 in the spinal cord and there were 3 venous cavernous angiomas of the cerebral hemispheres.

Presenting symptom was acute hemorrhage in 27 patients, 2 presented with a murmur, 1 with seizures and 2 with large heads. 14 patients were comatose on admission, 22 had focal neurological findings, 5 had normal neurological exams (3 of these had not bled) and 2 had large heads. Of those who bled, acute evacuation of the hematoma and removal of the AVM was performed in 7 cases. In 16, surgery was delayed until neurological improvement occurred. 6 of these 15 had intracranial pressure monitoring performed as part of their initial therapy. 2 children were brain dead on arrival at our hospital. There was 1 operative death in 29 operations, giving an operative mortality of 3.7%o 3 patients were not operated on after their first bleed because of the location of the lesion, and all 3 rebled eventually coming to surgery. There have been no further bleeds in any of the patients since operation. 2 patients who were operated on have rebled, 1 who had evidence of residual AVM after the first operation rebled 5 years later and died. The second child had a normal arteriogram after the first surgery and has had several bleeds from what appear to be multiple venous angiomas. This child’s arteriogram remains normal. Postoperative angiography was normal in 26 patients with residual AVM seen in 3. 1 of these children rebled and died, the other 2 remain normal 4 and 5 years later.

36 Spinal Tumors in Childhood
M. Kordás, K. Bőhm
National Institute of Neurosurgery, Budapest, Hungary

In our institute 110 children suffering from spinal tumor were operated between 1953 and 1980. Their age was between 0 and 14 years. Only the operated cases are collected. At

Abstracts of the Ninth Scientific Meeting

233

the same time 789 children with brain tumor were operated, while in the adults there were 804 spinal tumors and 3,784 brain tumors operated. There were 62 boys and 48 girls among our cases. In the early age the congenital tumor is more frequent (30 cases) as well as between 6 and 8 years (27 cases). The tumor is situated evenly at the full length of the spinal cord, it seems to be more frequent in the thoracal and lumbosacral regions. The tumors located extradurally or intra-durally occur more often than the intra-medullary and intradurally located tumors. Considering the histological classification the gliomas (26 cases), the sarcomas (17 cases) and terato-genic tumors located lumbosacraly are most frequent.

As first signs gait disturbance and pain develops. The local diagnoses are based on the X-ray and contrast examinations. The results of operations were improved by the microsur-gical technique. In case of malignant tumor cytostatic therapy is used beside X-ray therapy. We were able to follow more than 80% of our patients se we have a long katamnestic period and enough data.

37 Progressive Deformity of the Spine in Children with Intraspinal Lesions
S.J. Flood, B. Magenes Ullevål Hospital, Oslo, Norway

Intraspinal lesions may be evident through external changes and neurological deficits. However, lesions of the dorsal skin and subcutaneous layers may be lacking, and because of the great plasticity of the spine in children, a progressive scoliosis will precede the more serious neurological signs and symptoms. The growing spine will turn and twist and for some time relieve the tension on tethered or trapped nerve tissue. These children are first seen by the orthoped surgeon. 5 of 8 children with various intraspinal lesions seen during the last year were referred from an orthopedic hospital. A neurological examination, a plain roentgen film of the spine and a Metrizamide contrast myelogram were carried out before the primary intraspinal operation and the secondary orthopedic correction could be planned. The problems of diagnosis and combined neurosurgical and orthopedic treatment in 8 children 2½ to 14 years of age, with various types of tethered spinal cord and intraspinal tumors, are presented.

38 Computerized Axial Tomography in Intraspinal Neoplasms of Infants and Children
S. Oi, A.J. Reid

Although the number of invasive diagnostic procedures for intracranial lesions have been decreasing after computerized tomography (CT scan) appeared, the advantage of CT scan as a definitive diagnostic procedure for intraspinal lesion is still debatable. The purpose of this paper is to discuss the advantages of computerized axial tomography in the diagnosis of intraspinal tumors of children comparing the findings in spine X-ray, myelography and operations.

Abstracts of the Ninth Scientific Meeting

234

24 children with intraspinal neoplasms were analyzed. In extradural tumors, CT scan disclosed clearly the tumor extension to the paravertebral area in the cases of ganglioneuroma and neuroblastoma. The exact locations of a calcified mass in the spinal canal and bony destructions were seen in malignant lymphoma. In intradural-extradural tumors, intra- and extradural tumor involvement with enlarged neural foramen was demonstrated in CT scan in the cases of dumbbell-type malignant neurofibromas and schwannomas. Also in tumors such as lipomas and teratomas, associated with congenital malformations, CT scan showed more clear anatomical relations of these structures in the axial view. In intradural tumors not much informations except the existence of cystic cavity with the tumor were obtained in CT scan. Metrizamide CT scan was extremely useful in all lesions to identify the location, shift and expansion of the spinal cord.

In conclusion, we emphasize the advantages of CT scan in the diagnosis of intraspinal neoplasms, especially located in intradural-extradural or extradural space, in children which have different tumor types than adults.

S.N. Bhagwati, Geeta Parulekar
Grant Medical College, J.J. Group of Hospitals and Bombay Hospital, Bombay, India

A study of 598 cases of verified intracranial space-occupying lesions in children seen at the Neuropathology Unit of J.J. Group of Hospitals and Bombay Hospital, Bombay between the years 1953–1980 is undertaken to see how its profile compares with that of various series from other parts of the world.

Neuroectodermal tumors 287
Meningiomas 9
Schwannomas 9
Pituitary tumors 5
Vasoformative tumors 13
Tumors of maldevelopmental origin 50
Sarcomas 1
Lymphomas 1
Metastases 4
Tuberculomas 182
Fungal granulomas 1
Nonspecific granulomas 2
Miscellaneous 16
Total 598

An analysis of this data with a break up over the past three decades shows that as the incidence of tuberculomas decreases, the incidence of tumors approaches that found in the other series.

Abstracts of the Ninth Scientific Meeting

235

40 Intracranial Hemorrhage from Brain Tumors in Childhood
Keiji Saito, S. Waku, S. Manaka, K. Yamakawa, K. Takakura
Department of Neurosurgery, University of Tokyo, Japan

Among 331 cases of brain tumors in children under the age of 15, experienced in the past 18 years, 17 cases (5.1%) had intracranial hemorrhage from those tumors. They were 11 males and 6 females. Histological classification revealed 4 cases of astrocytoma, 4 cases of ependymoma, 2 cases of glioblastoma, 2 cases of oligodendroglioma and 1 case each of germinoma, medulloblastoma, choroid plexus papilloma, pituicytoma and choriocarcinoma. The locations were supratentorial in 8 cases, infratentorial in 8 cases and pineal in 1. Among infratentorial tumors, 3 were pontine gliomas. The clinical course was abrupt in 11 and slow in 6 cases. The outcome was good in 8 cases and fatal in 9. Possible provoking factors were ventricular drainage in 2 cases, ventriculoperitoneal shunting, angiography, leukemia, and head trauma in 1 each. The hemorrhage was intratumoral in 14, intracerebral in 2 and subdural in 1 case. Computerized tomography showed mixed density, or ring enhancement of nodule formation.

In summary: (1) In children, intracranial hemorrhage from brain tumors was not rare, contrary to general belief. (2) There was a tendency to frequent incidence in oligodendroglioma (25%), ependymoma (14.8%) and glioblastoma (13.3%). (3) In 7 of 9 fatal cases of this series, intracranial hemorrhage was the direct cause of mortality. (4) If one sees a child with intracranial hemorrhage, he should take a possibility of bleeding from neoplasms into consideration.

41 Primary Orbital Tumors in Children
A. Riccio, F. Caroll, CM. Carapella, E. Occhipinti
Department of Neurosurgery, Istituto Regina Elena, Roma, Italy

A series of 16 patients in pediatric age, operated on for primary orbital tumors in a period of 10 years, is presented. The indications of surgical treatment are discussed with regard to different operative techniques related to the site and the type of tumor. A critical evaluation of our surgical procedures is tried according to postoperative and long-term results. The value of combined radiotherapy and chemotherapy is considered also on the basis of the data of the
literature. Finally, the neurosurgical approach and the role of complementary therapies in the treatment of optic nerve glioma are emphasized, especially in relation to controversies about neoplastic or hamartomatous nature of such a lesion.

42 The Problem of Unilateral Exophthalmos in Children (Cooperative Study on 67 Cases)
Group for Neuroophthalmology and Orbital Disorders, University of Padova, Italy
An interdisciplinary clinical review of children (< 15 years), observed with a primary diagnostic problem of exophthalmos in a 25-year span (1954–1978), was conducted. According to Van Buren and co-workers, these exophthalmogenic lesions could be distinguished into 35 (52.2%) intraorbital (i.e., within the orbital fascia, whether primarily there or not) cases and 32 (47.8%) extraorbital cases. The latter still play a necessary role in the investigation of exophthalmos from retroorbital lesions (often aneurysms and arterio-venous cerebral malformations).

Some problems of treatment are discussed.

43 Orbital Dysplasias in Neurofibromatosis
L. Schut, D. Bruce
Children’s Hospital of Philadelphia and University of Pennsylvania School of Medicine, Philadelphia, Pa., USA
Neurofibromatosis is a syndrome of unknown etiology, hereditary in origin, probably of the neural crest involving not only the neuroectoderm and mesoderm but the endoderm as well, with the potential of appearing in any organ system of the body. Manifestations include café au lait spots, cutaneous and subcutaneous tumors and secondary mesodermal defects responsive for various osseous abnormalities. Of particular interest to the pediatric neurosurgeon are those manifestations related to the orbital wall itself that could be due to the presence of neurofibroma within the orbit, optic gliomas or dysplastic defects of the orbital wall. In this presentation we will report our experience with dysplastic defects of neurofibromatosis related to the orbit, with examples of plain films, angiographic examinations, computerized tomography of the herniation of the temporal lobe and our surgical experience with reconstruction of the posterior wall of the orbit in cases of exophthalmos and proptosis. The lessons learned in these cases can be further utilized in reconstruction of the orbit after traumatic deformities and in cases of tumors involving the sphenoid bone, such as meningiomas and fibrous dysplasia.

44 Cerebral Hemodynamics in Moyamoya Disease
Saburo Nakamura, Takashi Tsukamoto, Nobuo Moriya
Department of Neurological Surgery, School of Medicine, Nihon University, Tokyo, Japan
Hemodynamic examinations by way of functional cerebral angiography and CT scan were performed in 32 cases of Moyamoya disease. 15 cases were under 15 and 17 over 15 years of age. In children, the internal carotid artery was narrowed more widely, development of the basal rete mirabile was more remarkable than in adult cases, and collateral circulations through major cerebral arteries were poorly developed. Therefore, the cerebral blood flow may easily fall into circulatory disturbances. Those characteristics may be one of the reason why neurological deficits (i.e. motor palsy) are more frequent in children. Functional cerebral angiography by CO2 inhalation revealed two types of responses. One was a normal response, and the other a poor response in which the blood flow in the internal carotid artery was not increased.

45 Treatment of Patients with Moyamoya Disease by Temporal Muscle Graft (Encephalomyosynangiosis)
Shigekazu Takeuchi, Tadashi Tsudoi, Kazuki Kobayashi, Ryooji Ishii, Ryuichi Taniaka, Jusuke Ito
Department of Neurosurgery, Brain Research Institute, and Department of Radiology, School of Dentistry, Niigata University, Niigata, Japan
9 patients with Moyamoya disease were treated by temporal muscle graft for the purpose of increasing extracranial and intracranial collateral circulation. Their ages ranged from 7 to 16 years. 5 were male and 4 were female. The clinical manifestations included recurrent transient or completed weakness of limbs, mental retardation, involuntary movement of limbs, epileptic seizures and headache, with the side of involvement frequently alternating. No intracranial hemorrhage was encountered in their courses. After craniotomy and durocraniotomy, the arachnoid membrane near the olivovascular area in the angiography was opened on the sulci, and the temporal muscle was laid over the cortical surface. Among the 9 patients, 2 underwent STA-MCA anastomosis and temporal muscle graft simultaneously, and 5 received a muscle graft bilaterally. The patients were followed for 4 to 19 months. There was disappearance of transient weakness attack or improvement of paresis in 7, improvement of mental ability in 5, disappearance of involuntary movement in 3 and improvement of dysthria in 1. There were no ineffective cases clinically. Postoperative angiography was performed 1.5–9 months later in 10 sides of 7 patients. The middle
cerebral arteries were clearly visualized via thickened deep temporal arteries and the abnormal vascular networks in the region of the basal ganglia reduced in most of them. Improvements on EEG and cerebral blood flow measured by $^{33}$Xe inhalation method were also obtained in 6 and 8 patients, respectively.

46 Fibrosarcomas of the Dura in Children

M. Choux, A. Yokota, G. Lena, L. Barbera Hôpital des Enfants de la Timone, Marseille, France

Primary sarcomas of the dura are rare and only sporadic cases in infancy and childhood have been described in the literature, with considerable confusions in regard to their term.

Abstracts of the Ninth Scientific Meeting

238

ology and their biological behaviors. 2 cases of primary fibrosarcomas of the dura in children were experienced in this clinic for the last 10 years. Clinical symptoms and radiological signs of these cases were quite similar to those of meningiomas of this age group. In 1 case, aged 13, the tumor, having a localized, solid growth with small attachment to the dura, has not recurred 1 year after surgery. The other, aged 10, had a diffuse involvement of the dura with infiltrative growth into neighboring structures, and the tumor recurred 28 months after surgery with resultant death. Two different types of dural fibrosarcomas will be discussed from clinical and histological viewpoints.

47 Suprasellar Arachnoid Cyst: Investigation and Management

Harold J. Hoffman, E.B. Hendrick, R.P. Humphreys

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Since the advent of CT scanning in our institution in 1974, we have seen 7 patients with suprasellar arachnoid cysts. These patients have been compared to the 13 patients with suprasellar arachnoid cysts that have been described in the literature. Patients with suprasellar arachnoid cysts typically present with evidence of hydrocephalus, frequently have impaired visual acuity, and occasionally display the ‘bobble-head doll syndrome’, isosexual precocious puberty and hypopituitarism. The CT scan characteristically shows ventriculomegaly and the appearance of a cyst filling the anterior third ventricle which can easily be mistaken for a dilated third ventricle. Following this initial investigation, with the suspicion that a suprasellar cyst is likely present, we have investigated our patients typically by initially inserting a ventriculo-peritoneal shunt and then injecting metrizamide through the shunt reservoir into the ventricle and thus confirming the presence of a nonfilling suprasellar cyst on a metrizamide CT scan. Based on the experience in the literature and our own experience with these lesions, we feel that these cysts, if large, are best exposed by the transcaldosal route which allows one to easily unroof the cyst and allow free communication of the arachnoid cyst with the ventricular system, thus effectively obliterating the cyst.

With the now ready availability of CT scanning in the evaluation of the child with hydrocephalus, suprasellar arachnoid cysts, although rare, will be found with increasing frequency. Since these suprasellar arachnoid cysts can mimic the appearance of a dilated third ventricle, they can easily be confused with the far more common condition of congenital aqueduct stenosis. Treatment of such a patient by a bypass VP shunt will drain one lateral ventricle only and thus lead to dilatation of the opposite lateral ventricle as well as the cyst.

48 Pituitary Microadenomas in Children

Concezio Di Rocco, Giulio Maia, Patrizia Borrelli

Institute of Neurosurgery, Catholic University, and Pediatric Endocrinology Service, ‘Bambino Gesù’ Pediatric Hospital, Rome, Italy

13 children of both sexes and age ranging between 7 and 15 years underwent surgical removal of pituitary microadenomas through a transsphenoidal approach and microsurgical technique. In 13 children growth failure was the main complaint; in 5 of them a pubertal failure was clinically apparent. Precocious puberty was the presenting sign in the remaining

Abstracts of the Ninth Scientific Meeting

239

2 cases. Headache was reported in 14 patients. 4 children presented diabetes insipidus. The endocrinological evaluation disclosed a GH deficiency in all the cases with growth failure; in 8 children the GH deficiency was isolated, in 5 it was associated to Gn deficits (4 cases) and panhypopituitarism (1 case). The 2 subjects with precocious puberty showed abnormal high secretion of Gn. An immediate and persisting increase in growth rate and bone maturation was obtained in all the 13 children with delayed growth following the surgical removal of the microadenoma and the preoperative negative standard deviation in growth rate changed towards the normal values. In 8 of these patients the increase was such to allow them to reach normal values for age. Signs of pubertal maturation became apparent in 5 children after surgery. The pubertal signs disappeared in the youngest of the 2 children with precocious puberty while the second one showed only a reduction in the growth rate and bone maturation rate, accompanied by menarche and the occurrence of regular menses.

49 Intracranial Meningiomas of Childhood and Adolescence

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23 cases of intracranial meningiomas under the age of 20 years were diagnosed and operated upon in Cairo University hospital during the last 20 years. This represents 8.3% of intracranial meningiomas and 1.2% of primary intracranial tumours operated upon during the same period. Sex distribution was equal. The cases were anatomically divided into calvarial (13), basal (7), and subtentorial (3). The distribution with more anatomical precision will be described. The average duration of symptoms before surgery was 21 months, the shortest was 2 months and the longest was 8 years. The clinical picture, radiological findings and pathological will be discussed.

50 A Computer Analysis Study of Head Injury in Newborns and Infants

A.J. Raimondi, J. Hirschauer

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A retrospective study of all head-injured children aged 1–36 months admitted over the past 2 decades to the Children’s M. Hospital (Chicago) was accomplished with computer assistance. All tests for statistical significance employed the chi-square technique. A coma scoring system that is equally
unequivocal memory deficit. Based on normative data for both tests which were obtained previously in Galveston, cutoff scores were determined to identify the presence of an

recognition memory of pictures in 17 children (median age at injury = 9 years) who were tested at least 6 months postinjury (median = 16 months). 11 children

found not to be statistically correlated with a poorer outcome were focal seizures on admission, unilateral Babinski, unilateral ocular hemorrhages, or unilateral

bleeding. Tearing of the great vein of Galen also causes bleeding into the midbrain. Rarely, intracerebellar hematomas from contused cerebellum or

Focal low density area, ventricular dilatation, enlargement of cistern, and intracranial extracerebral low density area were recognized in CT scan. Abnormality

In this paper, the relation between the site of hemorrhage (4 groups) and the origin of bleeding will be discussed with a review of the literature. We will also

abnormality of CT scan was noted in unexpectedly numerous cases at considerable degrees of abnormality. The grading of neurological deficits before surgery was well correlated to the follow-up CT scan. Only 2 cases of epidural hematoma showed a normal CT scan. All of 17 cases of subdural hematoma were more or less abnormal in CT scan. Many cases did not show any marked neurological deficits, nevertheless they had some abnormality in CT scan.

This study considered the long-term effects of closed head injury on memory in children. We have examined verbal learning and memory and continuous

statistically correlated with poor outcome (p < 0.001) were presence of hemiparesis without ocular deviation, diastatic and bilateral linear fractures, split

hemorrhage in the posterior fossa of the newborn is not an unusual finding at autopsy. It is very important for us to detect the smaller treatable posterior fossa

Hemorrhage in the posterior fossa of the newborn is not an unusual finding at autopsy. It is very important for us to detect the smaller treatable posterior fossa

11 children sustained a severe closed head injury as defined by a Glasgow Coma Scale score of 8 or less, whereas 6 cases had less severe injuries. The selective reminding test of Buschke was used to assess verbal learning and memory, whereas the continuous recognition memory test of Hannay was employed to evaluate visual memory. Based on normative data for both tests which were obtained previously in Galveston, cutoff scores were determined to identify the presence of an unequivocal memory deficit.
Of the 11 patients with severe head injury, 7 evidenced a memory deficit at follow-up as compared to only a single patient with mild injury. The selective reminding and continuous recognition memory tests were similar in the number of children with defective test score. A duration of coma of 2 weeks appears to be a threshold beyond which the residual memory deficit is likely to persist. Cases of material-specific memory deficit were noted. A 9-year-old boy with a left temporal lobe contusion developed a specific impairment of verbal memory associated with a relative decline in his Wechsler Verbal IQ. In contrast, a 7-year-old girl who sustained a diffuse injury exhibited a specific impairment of recognition memory associated with a relatively low performance IQ. The results extend our previous findings of memory deficit during the first 6 months after head injury. In contrast to the widely held opinion that children are less vulnerable to sequelae of head injury, our findings indicate that sensitive tests of memory reveal persistent deficit.

Abstracts of the Ninth Scientific Meeting

242
54 Anterior Fossa Floor CSF Fistulae: Surgical Treatment by Transethmoidal Approach
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The surgical treatment of CSF fistula due to lesions located in the ethmoid not infrequently becomes a challenge to the neurosurgeon. Through a transethmoidal approach we have been able to reach and plug the ethmoidal fistulae with success. This technique was adopted recently and our experience is still restricted. We have done this procedure in 4 infants. One of them had previously been submitted, without success, to both ventriculo-peritoneal shunt and frontal craniotomy as classically advised. In all cases the fistula could be occluded at once. We believe that the transethmoidal route should be considered as an alternative method of treating CSF leakages surgically through the ethmoid. In our limited experience it has been shown to be a simple method which could be performed easily and quickly with excellent results.

55 Early Surgical Treatment of Traumatic Ethmoidonasal and Otogetic Liquoral Fistula
M. Mricevski
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During the last 15 years (1966–1979) we have treated 144 patients with fronto-ethmoido-orbito-basal and temporo-basal injuries. The dominant manifestation in our patients was an ethmoido-nasal and otogetic liquorrhoea, observed immediately after the injury or later. 42 children younger than 14 years were amongst our patients. There was a group of 8 patients with otogetic liquoral fistula which developed after a temporo-basal fracture of the head. All surgically treated children had a temporo-basal fracture of the head, with or without sigmoid sinus lesions. Diagnostics included physical examination, craniogram, computerized tomography and gamma-cysternography. Surgical treatment consisted of difrontal oseo-plastic or temporal trepanation with bone and dura mater lesions reconstruction. An early surgical treatment prevented the development of sequels or recidives and mortality.

56 Cerebral Abscesses in the Frame of Congenital Cardiopathies with Right-Left Shunts in the Child
A. V. Ciurea, Lenke Horvath, Alfoneta Mihuela Ciurea
Pediatric Division, Neurosurgical Clinic, ‘Dr. G. Marinescu’ Hospital, Bucharest, Romania

A series of 63 cases of cerebral abscesses diagnosed in children between 1936 and 1979 is presented. Classification according to etiopathogenic criteria showed 109 adjacent, 22 metastatic, and 14 post-traumatic abscesses, and 18 of unknown origin. Because of rarity, particular etiopathology and clinical and therapeutic difficulties, cerebral abscesses were investigated, occurring in congenital cardiopathies with right-left shunts. A total of 13 cases, or 7.97% of the total, was found. There was no sex preponderance. Ages varied between 5 and 16 years. The most frequently implicated of the congenital cardiopathies was Fallot’s tetralogy. Germs were isolated occasionally, but most of the cultures were sterile. Five abscesses were in the frontal area, 3 in the frontoparietal, and 2 in the parietal areas. In 2 cases 3 cerebral lobes were involved. There was one multiple abscess. Most of the abscesses were multilocular and encapsulated. The onset was with Jacksonian attacks, and motor defects. There was, however, high intracranial pressure. The treatment consisted in total exeresis under antibiotics and corticoid protection, craniogram, computerized tomography and gamma-cysternography. Surgical treatment consisted of difrontal oseo-plastic or temporal trepanation with bone and dura mater lesions reconstruction. An early surgical treatment prevented the development of sequels or recidives and mortality.

57 Intracranial Abscesses in Children: 41 Cases in 10 Years
F. Rueda-Franco, F. Santillán
National Institute of Pediatrics, Mexico City, Mexico

41 children (25 boys, 16 girls) with intracranial abscesses were attended from January 1971 to December 1980. 20 were under 2 years of age, 16 between 2 and 12 years and 5 were adolescents. Preferential locations were frontoparietal (17) and temporoparietal (12). 34 were intra-cerebral, 5 subdural and 2 epidural, we had 6 cases of multiple abscesses. Possible etiology in 37 cases included 13 with bacterial meningitis, 9 were metastatic, 7 otic infections and 7 head injuries. Irritability was present in 26 patients, vomiting in 26, fever in 23, headache in 18 and seizures in 15. Papilloedema appeared in 15 patients, hemiparesis in 15, meningeal signs in 14 and oculomotor paralysis in 10. Skull X-rays were abnormal in 30 patients, the EEG in 20 and midline displacement on echoencephalogram in 21. The nuclear scan was abnormal in 18 of 21 patients, 8 ventriculograms were of diagnostic value while 26 of 27 cerebral angio-grams demonstrated the lesions. The CT scan was abnormal in all 12 patients in which it was performed. All patients underwent surgery and the bacteriology of the purulent material recovered disclosed 10 gram+ and 9 gram-; 8 anaerobic, 1 case of Candida and in 10 cases the pus was sterile.
12 patients died. 13 of the 29 survivors are neurologically intact and 16 have varying degrees of sequelae.

58 Brain Abscess Associated with Cyanotic Heart Disease in Children
M. Kagawa, T. Shinohara, S. Yato, K. Kitamura Tokyo Women’s Medical College, Tokyo, Japan
In order to assess a clinical picture, surgical indication and long-term follow-up, the author reviewed 44 consecutive cases of brain abscess in children with cyanotic heart disease. Abscess occurred frequently between 3 and 11 years of age. Only 1 case was under 2 years old; 22 were male, 22 were female. 65% of cases had tetralogy of Fallot.

Abstracts of the Ninth Scientific Meeting

244
In conservative cases, the mortality was 72.3%, while the overall mortality of surgical cases was 26.2%. Regarding correlation between mortality and surgical methods, the most favorable outcome was obtained using extracapsular excision following repeated aspiration, the operative mortality being 0%. The operative mortality of aspiration alone was somewhat high, i.e. 43.8%. The most unfavorable outcome was revealed in the primary excision group, the mortality being 80%.

As regards long-term follow-up, 12.1% of cases died due to heart failure, 57.6% of cases had no neurological deficit, 27.4% of patients had mild to moderate focal dysfunction and 3% of cases were functionally incapacitated.

In conclusion, extracapsular excision following repeated aspiration is a treatment of choice for brain abscess with cyanotic heart disease, if the location is accessible.

59 Sequels of Transcallosal Approach
V. Benes
Neurosurgical Department Paediatric Faculty of Charles University, Prague, Czechoslovakia
10 children (2–13 years) have been operated on by transcallosal approach for cysts or tumors in the 3rd ventricle or in the pineal region. After repeated examinations in search for sequelae mentioned many times in the neurological literature, we arrived at these conclusions: (1) The transection of the anterior third of the corpus callosum has no clinical sequelae and may be recommended as a suitable approach to cysts or tumors in the anterior part of the 3rd ventricle. (2) Isolated transection of the posterior part of the corpus callosum not connected with the lesion of the brain (which is very rare) has sequelae in the sensitive and sensoric sphere, which are, however, of minor clinical importance. (3) The transection of the corpus callosum in connection with a pre- or postoperative lesion of the other part of the brain results in severe defects in the motoric, sensitive and sensoric spheres. The main sequelae are: (a) loss of recent memory; (b) ideomotoric apraxy (‘sign of the other hand’), and (c) astereognosy (anosmia). The cause of these sequelae lies in the morphological or functional interruption of the connection between motoric and verbal centres. In the modern conception this is caused by the disturbance of the proprioceptive analyser.

60 Residual Ophthalmological and Neuro-Otological Deficits after Surgery for Craniosynostosis: Clinical-Radiological Correlation
R. Giuffre, V. Camarda, F. Ambrosio, G. Guidetti, R. Raib, A. Spallone, L. Taverniti Institutes of Neurosurgery, Otorhinolaryngology and Ophthalmology, Rome University, Rome, Italy
85 out of 115 patients operated on for craniosynostosis in childhood between 1952 and 1980 were subjected to instrumental follow-up. The results of the ophthalmological study, hearing function tests, X-rays and CT scans are reported. Conduction deafness was present in 40% of the cases and perceptive deafness in around 45%. Vestibular function was impaired to a greater or lesser degree in over 70%. An X-ray study of the anatomical formations of the tympanum-ossicula auditus and of the otic capsule revealed morphological changes in about 85%.

Abstracts of the Ninth Scientific Meeting

245
20% of these cases. Residual neuro-ophthalmological deficits of varying nature and degree were found in 30%. CT scanning identified the abnormalities of reciprocal orientation of the ‘axes’ of the base of the skull and associated cranio-encephalic malformations. The importance of the base of the skull in the pathogenesis of craniosynostosis and its responsibility for impairment of the cranial nerves and of some sensory receptors are highlighted. Decompressive surgery on the cranial vault is of limited value.

61 Stereotactic Selective Thalamotomy for the Treatment of Cerebral Palsy in Adolescence
C. Ofrey, M. Miyazaki, T. Hirai, T. Shibazaki, T. Nagaseki Department of Neurosurgery, Gunma University, Maebashi, Japan
6 cases with tremor type cerebral palsy (group I) and 2 cases with severe dystonic type cerebral palsy (group II) were treated by stereotactic selective thalamotomy. In all cases, perinatal problems (asphyxia, premature birth) were noticed. Although more or less disabled, intelligence was almost normal, and they adapted to the normal social life except for cases of group II. In group I, postural-movement type tremor and athetosis were coexistent. A characteristic feature was that the tremulous movement gradually increased with age. To ameliorate the abnormal movement, stereotactic operation was performed under local anesthesia. With the aid of radiological and neurophysiological control methods, the kinesthetic neuron of the thalamic ventralis intermedius (Vim) nucleus was identified and a small lesion was placed there. Satisfactory improvement was achieved in all but one, in which abnormal neck movement was not influenced. In group II, severe dystonic posture with athetotic and tremulous movements were observed bilaterally. The upper limb was retracted backward in a volitional effort, thus disturbing its usage. Stereotactic thalamotomy was performed focussing on the girdle muscles of the more affected side. In these cases, Vim and ventralis lateralis nucleus were coagulated. After the operation, abnormal muscle tone of the girdle muscles was reduced and postoperative physical therapy was greatly facilitated.

It might be emphasized that motor disturbances of cerebral palsy could be modified with age and tremor became more apparent in adolescence, especially in light cases. Stereotactic Vim thalamotomy at this stage was shown to be quite effective. In severe cases also, element of tremor was detected, and stereotactic selective thalamotomy might be a safe and effective way to make one step forward.

62 Chronic Cerebellar Stimulation in Cerebral Palsy
L. Ivan, E.C.G. Velureyna
change as compared to the preoperative state. 1 patient became worse after surgery and 1 patient died several months after an uneventful surgical procedure. The incidence of seroma and postoperative infection was below 20% and usually responded to vigorous treatment with antibiotics or CSF diversion. The authors find the results disappointing and they are of the opinion that the method should be further explored using double-blind prospective studies. A short motion picture will illustrate certain technical modification which were found useful in the technical aspect of the procedure.

63 Brain Stem Auditory Evoked Response in Children with Myelomeningocele and the Arnold-Chiari Malformation
B.N. French, A. Brooks, A.J. Gabor
University of California, Davis-Sacramento, Calif., USA
The functional integrity of the brain stem was examined by the brain stem auditory evoked response (BAER) in 22 children between 1 1/2 months and 11 years of age with myelomeningocele, shunted hydrocephalus and the Arnold-Chiari malformation. 18 children were asymptomatic; 2 were symptomatic from blocked shunts and 2 had symptomatic Arnold-Chiari malformations. The BAER was recorded with a standard Nicolet model CA-1000 clinical averager. Click stimuli produced by 200-μs square waves were presented monaurally without masking at rates ranging from 7 to 15 Hertz. Click intensity was adjusted to 65 dB above hearing threshold or to an arbitrary 85 dB if threshold could not be measured. Two or more series of 2000+ stimuli were averaged for each ear with the activity recorded differentially between the ipsilateral earlobe and the vertex. Measurements were made of the absolute latencies of wave I (normal 1.3–3.2 ms); wave III (normal 3.2–5.4 ms) and wave V (normal 5.0–6.3 ms); interwave latencies between I—III (normal 2.40 ms), I—V (normal 5.4–5.6 ms) and III—V (normal <2.26 ms); and the IV—V/I ratio (normal >0.5).

The BAER was abnormal in 18 of 22 patients (86%). The absolute latencies measured in 44 ears were abnormally prolonged in 9% for wave I, in 27% for wave III, and in 64% for wave V. The interwave latencies measured in 44 ears were abnormally prolonged in 64% for I—III, in 70% for I—V and in 48% for III—V. The IV—V/I ratio was abnormal in 30% of 44 ears including 2 patients with normal interwave latencies. The BAER in children with myelomeningocele and the Arnold-Chiari malformation is frequently abnormal. Retrocochlear abnormalities extend from the medullopontine junction to the level of the inferior colliculi. Conduction times were more frequently prolonged at the medullopontine junction (I—III) than in the upper brain stem (III—V and IV—V/I ratio) in this series.

64 Hamartomas of the Tuber Cinereum and Precocious Puberty
G. Frank, E. Cacciari, G. F. Cristi, E. Frejaville, E. Galassi, G. Gaist, F. Frank, S. Salardi, L. Mazzanti, P. Tassoni
Departments of Neurosurgery, Neuroradiology and Pediatric Endocrinology, Ospedale Bellaria, Bologna, Italy
It is well known that hamartomas of the tuber cinereum often cause true precocious puberty. Our patients were studied only from the neuroradiologic standpoint. Is the diagnosis

Abstracts of the Ninth Scientific Meeting
246
of hamartoma of the tuber cinereum possible on the basis of clinical and neuroradiologic data alone? The authors believe that this entity is characterized by a definite clinical and neuroradiologic picture: (1) true precocious puberty without neurological symptoms; (2) occurrence of the lesion at the level of posterior hypothalamus; (3) its iso dense aspect not enhanced after contrast medium administration. These lesions have benign prognosis. We believe that the aim of the operation is to obtain histological diagnosis and to restore normal hormonal function. The latter aspect will be verified on the basis of further surgical experience.

65 Some Clinical Remarks on Neuroblastoma in Children: Report of 3 Cases
J. Wocjan, Z. Szlaminski, Z. Gajewski, M. Roszkowski, K. Wocjan
Department of Pediatric Neurosurgery, Memorial Hospital, Child Health Centre, Warszawa-Miedzyzlezie, Poland
Among about 600 cases of intracranial and spinal tumors observed in the Department of Pediatric Neurosurgery in Warsaw, we found 7 neuroblastomas. Our report is based on 3 observations of neuroblastoma treated in our Department in last year. All these cases presented some diagnostic problems. In the first case neuroblastoma was located in mediastinum and in the thoracic part of the spinal cord, in the second case the tumor was located in abdomen and lobar part of the spinal cord. In the last case we stated the presence of neuroblastoma in the mediastinum without infiltration of the medulla, but the second focus was present in the right cerebral hemisphere with predominance in the temporal region. All cases were operated upon and in all patients total removal of the tumor was possible. After surgery radio- and chemotherapy was performed. In 2 cases, the general and functional results were very good. In last case (thoracal region of the spinal cord) persistent paraparesis is observed.

In conclusion, the authors state that neuroblastomas in children may present some diagnostic difficulties, but in many cases the obtained results are good.

66 Metastatic Hepatoblastoma: 10 years’ Survival Following Removal of Brain Metastasis
J. Haase, C. Pedersen, H. Brincker
Department of Neurosurgery, Odense University Hospital, Odense, Denmark
A 2 V2-year-old boy developed signs of hepatic tumor and a right-sided hemipatectomy was carried out. A histological hepatoblastoma was diagnosed without signs of metastases. 2 years later a large, solitary metastases in the lower lobe of the right lung was removed by pneumonectomy. Within 2 months
signs of increased intracranial pressure developed and a brain scan demonstrated a solitary, 4-cm brain metastases in the left parieto-occipital region. The tumor was completely removed with an uneventful postoperative follow-up. However, shortly after, a pathological, spontaneous fracture in the right femoral bone revealed bone metastases. Cobalt-60 radiation was started for the bone metastases and a 3-year program of chemotheraphy with endoxan, vincristine, methotrexate and fluorouracil was started. The bone metastases disappeared and the fracture healed. The boy has now been followed for 10 years without further signs of metastases. Due to the dislocation of the trachea following pneumonectomy and a reduced T lymphocyte function, repeated upper respiratory tract infections was his major problem in the follow-up period.

Abstracts of the Ninth Scientific Meeting

248

This report emphasizes the importance of chemotherapy and the necessity of an aggressive treatment of even ‘inoperable’ tumors. To the best of our knowledge, this is the first reported case of metastasing hepatoblastoma with cure.

67 Primary Intracranial Retinoblastoma

J. Oakes, E. Bullitt

Duke University, Durham, N.C., USA

A 10-month-old infant with a genetically determined small unilateral peripheral retinal tumor was also found to harbor a large suprasellar tumor. The intracranial tumor was shown to have the histological criteria of a primary (nonmetastatic) retinoblastoma. It is postulated that the genetic form of retinoblastoma may manifest itself by the formation of a tumor arising spontaneously within the brain.

68 Surgical Treatment of Pulsesing Exophthalmos Secondary to Neurofibromatosis

R. Michael Scott, Joel Abramovitz.

Department of Neurosurgery, Tufts-New England Medical Center, Boston, Mass., USA

We treated a patient with neurofibromatosis and pulsating exophthalmos by repairing the orbital bone defect with rib graft struts. The globe pulsations ceased and the exophthalmos has been stable or slightly improved after a 1½-year follow-up. Due to the rarity of the syndrome and the paucity of information regarding its operative repair, we are presenting our case in detail and reviewing the relevant literature.

69 Cystic Cerebral Astrocytomas in Infancy and Childhood: Long-Term Results

L. Palmer, A. Russo, S. Mercuri

Istituto di Neurochirurgia, Università di Roma, Roma, Italia

24 cases of cystic cerebral astrocytoma represent 12% of 200 supratentorial tumors of the pediatric age group operated. Both macro- and microscopically, such tumors resembled the well-known cerebellar astrocytoma, presenting as a large cyst with a mural nodule with the pattern of a piloid astrocytoma (i.e. spongiosblastoma of the German school). The preferential site of incidence was the temporal lobe (55%) and the age peak was of 7 years without sex prevalence. The surgical technique consisted in the extirpation of the mural nodule, preceded by emptying the cyst, followed by opening the contiguous ventricular wall. The extirpation was partial in one-third of cases of whom the minority underwent radiotherapy. 1 patient died after the operation while 2 others died from tumor recurrence after 3 and 4 years, respectively, both being mixed tumors (oligo-astrocytoma) that were irradiated post-operatively. The follow-up ranged from 10 to 29 years in 80% of the cases. The long-term functional result of the available 17 patients is as follows: Good (perfectly well), 12 cases = 70%. Fair (minor troubles), 5 cases = 30%. 3 of the 5 cases with a fair result had a partial resection.

In conclusion: (1) There is a small group of supratentorial tumors in children that is very similar to the ‘classic’ cerebellar astrocytoma, sharing with him the same benign biological behavior. (2) Total extirpation of the mural nodule should be the goal of the surgery but a partial excision can also be followed by a benign course. (3) The occasional discovery of a mixed tumor seems to be associated with a bad prognosis. (4) Radiotherapy has no place in such tumors after total excision while it is questionable after partial excision.

70 Embryonal Carcinoma of the Hypothalamic Region

J.M. Izquierdo, J. Diaz de Tuesta, F. San Emeterio, J.M. Coca, R. Sarabia Neurosurgical Service, University Hospital, Valladolid, Spain

Only about 5 cases of intracranial embryonal carcinoma have, to our knowledge, been published up to now, and only 1 of them was located in the hypothalamus. For this rarity, there are not yet any established or definite criteria regarding the management of such tumors, especially as far as therapy is concerned.

We think it the refore interesting to make known a new case, with a follow-up period of 1 year, in which chemotherapy with BCNU, after surgery and radiotherapy, proved to be useful.

An 8-year-old boy developed diabetes insipidus and 4 months later signs of precocious puberty and gynecomastia. After 6 months he became progressively subresponsive and eventually unconscious. The CAT disclosed a hypothalamic tumor and the patient was operated on. On the supposition that we were dealing with a germinoma, only some pieces of tumor were removed. The pathological diagnosis was embryonal carcinoma.

The radiotherapeutic treatment did not change the patient’s situation, but chemotherapy (BCNU) was very effective. The child recovered and the symptoms tumor were removed. The pathological diagnosis was embryonal carcinoma.

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In conclusion: (1) There is a small group of supratentorial tumors in children that is very similar to the ‘classic’ cerebellar astrocytoma, sharing with him the same benign biological behavior. (2) Total extirpation of the mural nodule should be the goal of the surgery but a partial excision can also be followed by a benign course. (3) The occasional discovery of a mixed tumor seems to be associated with a bad prognosis. (4) Radiotherapy has no place in such tumors after total excision while it is questionable after partial excision.

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The radiotherapeutic treatment did not change the patient’s situation, but chemotherapy (BCNU) was very effective. The child recovered and the symptoms disappeared.

71 Germinoma Involving Unilateral Basal Ganglia and Thalamus

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6 cases of germinoma involving unilateral basal ganglia and/or thalamus was studied regarding their biological nature and clinical characteristics. The incidence was estimated as 10% of all intracranial germinomas. The average age at the onset was 10.5 years old. The sex incidence showed male dominancy.
alone decussates within the mid-brain. If the trochlear nerve is so easily injured, why is trochlear nerve palsy so seldom recognized?

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occipital horn of the left lateral ventricle was found. Noteworthy are the patient's age, the location of the tumor and the scarcity of neurological signs.

73 Intraventricular Meningeoma in a Child

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A case of intraventricular meningioma is reported in a 15-month-old boy. The pregnancy, birth history and development during the first 14 months of life were normal. In the 15th month the child developed clonic twitching, affecting the right side of the face and the right extremities. The seizure lasted only a few seconds. CT scan was characteristic of meningioma involving the left occipital lobe. The child underwent an operation and an encapsulated meningioma of the occipital horn of the left lateral ventricle was found. Noteworthy are the patient's age, the location of the tumor and the scarcity of neurological signs.

74 Culture Characteristics of Ependymomas and Medulloblastomas Occurring in Childhood

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Brain tumors after surgery are routinely submitted for tissue culture in our Institute. Experiences proved that this method produced useful practical information about the biological behaviour of tumors. Out of 225 various brain tumors removed from children the highest number cultured were ependymomas and medulloblastomas. Within the group of ependymomas benign and malignant types could be distinguished immediately after explantation. Benign ependymomas were characterised by low adhering and growth capacity of their cells. The surviving cellular elements of these samples remained unchanged during the full period of cultivation. Malignant ependymomas were characterised by increased adhering capacity and active proliferation of cells. During cultivation of these latter biopsies various cell shapes developed in the following sequences: primitive neuroepithelial cells, undifferentiated glial elements with cytoplasmic processes, small and big astrocytes. The presence of primitive cell forms and the degree of cytoplasticity were considered as markers of malignancy. Culture diagnoses were proved by the course of disease and by the appearance of recurrences. In cultures

Abstracts of the Ninth Scientific Meeting

251

of medulloblastomas, primitive neuroepithelial, pilocytic and neurocytic types could be distinguished on the basis of cellular composition. Despite differences revealed in cultures, no differences appeared in the course of the disease. The cytomeorphological differences of cultured medulloblastomas seem to be important regarding the cellular origin of these neuro-germinoma growths and are of interest from the theoretical point of view.

75 Sleep Apnea as an Isolated Neurologic Sign Corrected by Cervical Stabilization

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Neurosurgeons have long been aware of the ‘sleep apnea’ syndrome or Ondine’s curse as a complication of bilateral high cervical cordotomy. In children the central form of sleep apnea occurs as a result of neonatal asphyxia or abnormalities at the cervicomedullary junction. Although they must reside in the anterior quadrants of the upper cervical spinal cord, the pathways subserving automatic respiration have not been anatomically defined. A 5-year-old girl with a history of sleep apnea since the perinatal period was found to have a subluxation of C1 on C2 and an os odontoideum malformation. Halo immobilization and C1 to C3 fusion resulted in the restoration of CO2 responsiveness, the hallmark of this her only neurologic abnormality. When the halo cast was removed at 3 months, she abruptly worsened and her CO2 responsiveness returned to zero. She was found to be unstable at occiput to C1, and was returned to the halo, and the fusion was extended to include the occiput. She has now regained CO2 responsiveness. Sleep apnea syndrome may be an isolated neurologic abnormality of the upper cervical spine and if a surgical lesion is found may be correctable.

76 Why Trochlear (IV) Nerve Palsies Are So Seldom Recognized

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Methods: Re-evaluation of the trochlear (IV) nerve indicates that the trochlear nerve may be traumatized in head injuries. The fourth cranial nerve has three unique features that contribute to its vulnerability: (1) It is the most slender cranial nerve. (2) It alone originates from the dorsal aspect of the brain stem. (3) It alone decussates within the mid-brain. If the trochlear nerve is so easily injured, why is trochlear nerve palsy so seldom recognized?
Results: A transient diplopia of inferior lateral gaze after head injury is easily missed, especially in children. If a child gets to his feet after being stunned by a head injury, or a somersault, he is often unsteady and may shake his head while looking to the ground or hold his head at an unusual angle. This history should alert the examiner to carefully assess diplopia caused by a transient trochlear nerve palsy. Routine testing for diplopia will usually fail to recognize a trochlear nerve palsy. Therefore, neurological examination in these cases should include walking downstairs.

Conclusion: The trochlear nerve is vulnerable, even in minor head injuries, and trochlear nerve palsy may be a useful sign of brain stem injury.

Abstracts of the Ninth Scientific Meeting

77  Pain in Children with Spinal Cord Tumors
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Pain in children with central nervous system disease is often overlooked as a symptom leading to a diagnosis. To some extent this relative neglect may be a result of a general belief that pain is less of a problem in the pediatric age group. This is particularly true with spinal cord tumors in early childhood. The authors reviewed 58 spinal cord tumors encountered at the Children’s Memorial Hospital from the years 1970 to 1980. Pain in the age group younger than 15 years and up to 15 years was analyzed and categorized according to intramedullary, intradural, or extradural involvement of the tumors. Among 58 cord tumors, 21 were intradural extramedullary; 12 intramedullary; and 25 extradural. The meaning of pain and its management in the pediatric age group is discussed.

78  Hemispherectomy in Childhood
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2 cases of hemispherectomy, ages 5 and 6 years, because of infantile hemiplegia and intractable seizures are presented. Both patients have remained seizure-free. The first case was a right hemispherectomy in a 5-year-old boy. The second case followed 2 years later and was a left hemispherectomy in a 6-year-old girl. Both children have gone on to improved classwork activity and improvement of their hemiparesis. Extensive neuropsychological testing prior to the surgical procedure and for follow-up periods ranging from 4½ to 2½ years following the surgical procedures have documented continued intellectual improvement. These examples of hemispherectomy in childhood are compared with that in the literature. It is suggested that hemispherectomy be accomplished at the earliest feasible date in order to maximize intellectual improvement.