XXVTH MEETING OF THE CANADIAN CONGRESS OF NEUROLOGICAL SCIENCES BANFF, JUNE 1990 PROGRAM

Monday, June 25

SATELLITE SYMPOSIUM - Management of Pain Through Implantable Devices

Banff Springs Hotel
Presented by Medtronic of Canada Ltd.
(Please refer to registration information enclosed.)

Morning

Neurostimulation and Pain	
The History of Neuro Stimulation	S. Kenyon, Medtronic
Neuromodulation & the Nervous System	E. Herman, Hamilton
- Mechanism of gating and endogenous opiate release	
Profile of the Pain Patient	
- Question period	
Deafferentation and Central Pain	R. Tasker, Toronto
- Indications, patient selection, treatment and clinical results	
- Question period	
Low Back Pain & Failed Back Surgery Syndrome	G. Vanderlinden, Toronto
- Indications, patient selection and clinical results	
- Question period	

Afternoon

Spinal Cord Stimulation	
Peripheral Vascular Disease	K. Kumar, Regina
- Indications patient selection and clinical results	
- Question period	
Report on PVD Clinical Programs	G. King, Minneapolis
Implantable Devices for Spinal Cord Stimulation	L. Bourgault, Medtronic
Surgical Technique	N. Martinez, Montreal
Patient Support Follow-up	TBA

Tuesday, June 26

Morning

Management of Pain Through Implantable Devices - continued

Electricity: An overview	G. Findley, Medtronic
Hands-on session	
- Programming an RF system: X-Trel	
- Programming an implantable system: Itrel II	
- Programming an implantable drug pump: Synchromed	
Deep Brain Stimulation	
- Indications, patient selection and clinical results	K. Kumar, Regina
Surgical Technique for Deep Brain Stimulation	P. Allen, Edmonton
- Leads, stereotactic frames, CT scan	
New Indications & Technologies	
Angina and PVD Pain: Case Report	N. Martinez, Montreal
Implantable Drug Administration Devices	TBA
- Indications and clinical results	

Canadian Association for Child Neurology Annual Meeting

Banff Springs Hotel
Supported by a contribution from **Parke Davis**

Morning

Optimizing the Management of Hypoxic Ischemic Injury	
Perinatal Hypoxia and Epileptogenesis	C. Lombroso, Boston
Excitatory Amino Acid Pathways	M. Johnston, Baltimore
The developing brain	
- Plasticity and injury	
Panel discussion - Case presentation	R. Haslam, Toronto C. Lombroso, Boston M. Johnston, Baltimore S. Seshia, Winnipeg

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Afternoon

Epilepsy	
Canadian League Against Epilepsy Lecture	J. Ferrendelli, St.Louis
"Biochemical mechanisms underlying the pharmacology of antiepileptic drugs"	
Case discussion - A child with epilepsy	
Neonatal Seizures	C. Lombroso, Boston
Neonatal EEG case presentations	C. Lombroso, Boston H. Darwish, Calgary

MINI SYMPOSIUM - New Concepts in Stroke Management

Presented by the Canadian Stroke Society

Subarachnoid Haemorrhage	M. Finley, Edmonton
NASCET: A model of surgical management.	G.G. Ferguson, London
Lacunes: An obsolete concept?	C. Miller Fisher Emeritus Professor of Neurology, Harvard University, Boston

MINI SYMPOSIUM - Advances in Migraine Prophylaxis

Presented by Janssen Pharmaceutica

(Please refer to registration information enclosed.)

Opening Remarks	J. Edmeads, Toronto
Current Concepts of Migraine Pathophysiology	N. Raskin, San Francisco
An Overview of Migraine Prophylaxis	T.J. Murray, Halifax
Neurological Uses of Calcium Channel Blockers	J. Kreeft, London
Canadian Clinical Trials Results with Flunarizine	D. Simard, Quebec

Wednesday, June 27

Morning

MINI SYMPOSIUM - Clobazam in the Treatment of Epilepsy

Chairman: J. Bruni

Presented by Hoechst Canada

Clobazam: A new anticonvulsant drug	J. Bruni, Toronto
The Use of Clobazam in Pediatric Seizure Disorders: The Canadian Experience	K. Farrell, Vancouver
The Use of Clobazam in Adult Seizure Disorders: the Canadian Experience	A. Guberman, Ottawa

Pre-Congress Courses

COURSE 1: Surgery of the Skull Base

Chairpersons: C. Tator & M. Long

Morning

Anatomy of Surgical Approaches to the Skull Base	E. Dolan, Toronto
Anatomy of the Cavernous Sinus	D. Parkinson, Winnipeg
Surgical Management of Cavernous Sinus Lesions	L. Sekhar, Pittsburgh
Management of Acoustic Neuromas	M. Samii, Hanover, FRG
Intra-operative Cranial Nerve Monitoring	C. Tator, Toronto

Afternoon

Trans-oral Approaches to the Odontoid	A. Menezes, Iowa City
Management of Clival Lesions	L. Sekhar, Pittsburgh
Combined ENT/Neurosurgical Approaches to Lateral Skull Base	D. Oldring, Edmonton
Management of Posterior Fossa Meningiomas	C. Tator, Toronto
Techniques of Facial Nerve Anastomosis	M. Samii, Hanover, FRG
Panel discussion/Case presentations	

COURSE II: Neuroembryology and Cerebral Dysgenesis

Chairman: H. Sarnat

Supported by a grant from the **Alberta Heritage Foundation for Medical Research**

Morning

Overview of Developmental Processes and Disorders of Cerebral Maturation	H. Sarnat, Calgary
Embryology and Pathology of Axial Skeletal and Neural Dysraphic Disorders	M. Marin-Padilla, Hanover, NH
Surgical Implications of Cerebral Dysgenesis	D.D. Cochrane, Vancouver
Synaptic Dysgenesis	L.E. Becker, Toronto
Golgi Studies of Early Cerebral Cortical Plate Formation and of Normal and Damaged Perinatal Brain	M. Marin-Padilla, Hanover, NH
Panel discussion	

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COURSE III: Vertigo and Nystagmus

Chairman: W. Fletcher

Morning

Physiology of the VOR	J. Sharpe, Toronto
Nystagmus - A simplified approach	W. Fletcher, Calgary
Vertigo - clinical examination and laboratory testing	T. Hain, Baltimore
Vertigo - differential diagnosis and treatment	R. Baloh, Los Angeles
Round table discussion and question period	

COURSE IV: Neuropathology Update

Chairman: N. B. Rewcastle

Afternoon

Introduction and overview	N.B. Rewcastle, Calgary
Molecular Biology and Contemporary Neuropathology	B. Curry, Calgary D. Demetrick, Calgary
Motor Neurone Disease and Gene Expression	A.C. Clark, Calgary
Excitatory Aminoacid Receptors on Striatal Neurones - Pathophysiological perspectives	S. Weiss, Calgary
The Role of Excitatory Aminoacids in Cerebral Ischemia	B. Tranmer, Calgary
Amyloid Precursor Protein in Neural Degeneration	I. Parhad, Calgary
The Phakomatoses - An update	T. Bech-Hansen, Calgary

COURSE V: Update on Clinical EMG and Neurophysiology

Chairmen: T. Benstead and G.S. Tardif

Afternoon

Basis for Electrophysiological Evaluation of the Neuromuscular Junction	T. Benstead, Halifax
Single Fibre - EMG	E. Stalberg, Uppsala, Sweden
Evaluation of Myopathy	M.H. Brooke, Edmonton
Computer Techniques	E. Stalberg, Uppsala, Sweden
Approaches to the Evaluation of the Autonomic Nervous System	J. Stewart, Montreal

Thursday, June 28

Morning

PLENARY SESSION #1 - Guests of the Congress

Welcome

Opening of the Scientific Session
Bryce Weir
President
Canadian Neurosurgical Society

Penfield Lecture
Canadian Neurosurgical Society
Professor M. Samii, Hanover, FRG
Management of "Craniopharyngioma"

Kenneth MacKenzie Memorial Award

FREE COMMUNICATIONS

Afternoon

"Meet the Expert" Lunch - Neurosurgery
M. Samii, A. Menezes, L. Sekhar

PLENARY SESSION #2 - Guests of the Congress

Chairman: Bryce Weir

Speaker of the Royal College of Physicians and Surgeons of Canada
Neurosurgery
A. Menezes, Iowa City
"Rheumatoid Problems at the Craniocervical Junction"

André Barbeau Memorial Prize For Basic Research in Neuroscience

FREE COMMUNICATIONS

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Friday, June 29

Morning

PLENARY SESSION #3 - Guests of the Congress

Chairman: Donald W. Paty
President - Canadian Neurological Society

Richardson Lecture
Joseph B. Martin, San Francisco
"Challenges for Neurology in the Nineties: Will we survive?"

McNaughton Prize for Clinical Research in Neuroscience

Canadian Society of Clinical Neurophysiologists Lecture
E. Stalberg, Uppsala, Sweden
Neurophysiological Techniques to Study Reinnervation

FREE COMMUNICATIONS

Afternoon

"Meet the Expert Lunch" - Adult Neurology
R. Baloh, J. Sharp, T. Hain
"Meet the Expert Lunch" - Pediatric Neurology
M. Johnston

PLENARY SESSION #4

Canadian Association for Child Neurology Guest Lecture
Michael Johnston, Baltimore
Mechanisms of Neuronal Damage

President's Prize
Canadian Association for Child Neurology

FREE COMMUNICATIONS

Saturday, June 30

SYMPOSIUM - Functional Recovery in the Nervous System

Chairman: Robert Lee

Synopsis: Recent advances in electronics and computer technology have opened the door for innovative new approaches to replace or restore functions which have been lost as a result of damage to the nervous system. At the same time there have been exciting developments emerging from basic neuroscience research which indicate that the adult central nervous system has much more potential for recovery of function following damage than was previously believed. This symposium will bring together experts from several different fields who will discuss the impact which these new developments are likely to have on clinical neurology and neurosurgery.

What is the potential for recovery of function following damage to the CNS?	J. Diamond, Toronto
Use of patterned electrical stimulation to restore motor function after CNS damage.	R. Stein, Edmonton
Functional recovery from a neurosurgical perspective.	J. Girvin, London

Speaker of the Royal College of Physicians and Surgeons of Canada — Neurology

What has molecular neuroscience taught us about functional recovery? Demyelinating disease as a model.	Stephen Waxman, New Haven
Neural prostheses - What can we expect in the future?	G. Loeb, Kingston

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XXVth Meeting of the Canadian Congress of Neurological Sciences

Abstracts of the Scientific Program

Platform Presentations

Poster Presentations

Platform Presentations

THURSDAY, JUNE 28, 1990 - A.M.

Pediatric Neurology

1.

Human Immunodeficiency Virus Replicates in Primary Human Fetal Brain Cells

A. NATH, K. AMEMIYA and E.O. MAJOR (Bethesda, U.S.A.)

AIDS dementia complex is an early and frequent manifestation of human immunodeficiency virus (HIV) infection, but its pathogenesis remains unknown. To determine if HIV can replicate in brain derived cells, dissociated cultures from human fetal brain (8-14 weeks gestation) and separated astrocyte cultures were established and infected with a HIV strain (NL4-3) or transfected with the HIV provirus (pNL4-3). Rising titers for p24 antigen in culture supernatants were seen in the first 2-5 days after infection and as early as 4-8 hours following transfection. Small amounts of p24 were present for at least 6-7 weeks after transfection of astrocytes. No cytopathic or morphological changes were noted in these cultures. Infectious virions were present in all cultures after transfection as determined by co-cultivation with a CD4+ cell line (A3.01) but could not be determined in the cell free supernatants 3-4 weeks after transfection. Cell to cell contact was necessary for detecting infectious virions in long term cultures. Chloramphenicol acetyl transferase (CAT) assay was used to determine the transcriptional efficiency of the HIV regulatory sequences in the astrocytes. The cells were co-transfected with pNL4-3 and a plasmid pBenn CAT in which the HIV long terminal repeat was linked to the CAT gene. CAT activity paralleled the increase in p24 antigen following transfection. These results suggest that HIV is a neurotropic virus. It can transcribe, replicate and produce infectious virions in astrocytes. It establishes a low level persistent infection in long term fetal astrocyte cultures.

2.

Benign Neonatal Sleep Myoclonus

S.S. SESHIA and J. DAOUST-ROY (Winnipeg, Manitoba)

We know of less than 20 cases with this entity which is characterized by (i) neonatal onset, (ii) myoclonus only during sleep, (iii) self limiting course and (iv) good outcome. In the past four years, we have seen 9 infants who meet these criteria.

All were referred within the first week of life because they were suspected of having seizures. Movements were myoclonic in nature and focal, multifocal or generalized in distribution. They usually lasted a few seconds and tended to cluster over 3-5 minutes. But, in 3 children, the episodes lasted 1/4 to 1 hour. Two of the 3 were treated intensively but unsuccessfully with anticonvulsants. The movements could not be stopped by light pressure but ceased promptly when the infant was aroused.

Clinical events, without EEG correlate other than artifact, occurred during 21 channel polygraphic EEG monitoring in all infants. There was no relationship to a specific sleep state. The background activity was normal in 8/9. An excess of sharp transients was seen in 4. Positive sharp waves over the temporal/central regions occurred in 6. A representative example follows:

Baby R was born at term after an uneventful pregnancy and delivery. Jerking movements began on the second day of life and were "intractable", often lasting 1/2-1 hour. There was no response to anticonvulsants and pyridoxine. Non epileptic myoclonus was suspected because the movements only occurred during sleep and could be stopped by arousal, an observation confirmed during an EEG. Anticonvulsant treatment was discontinued. The movements remitted by 4 months of age. He was neurologically and developmentally normal at 1 year.

Recognition of the syndrome is important to avoid anticonvulsant treatment.

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3.

Somatosensory Evoked Potentials in Full-Term Asphyxiated Neonates

M.J. TAYLOR, H.E. WHYTE and W.J. MURPHY (Toronto, Ontario)

In earlier studies we found that visual evoked potentials (VEPs) recorded in the first week of life were reliable prognostic indicators of neurodevelopmental outcome in asphyxiated infants. However, in older children in coma we have found that VEPs are less reliable prognostically than somatosensory evoked potentials (SEPs). The current study examined SEPs in asphyxiated neonates to determine if they would better predict outcome than VEPs.

Forty-seven term asphyxiated neonates, classified according to Sarnat's criteria, were studied. All had median nerve SEPs recorded during the first 3 days of life and repeated during the first week and/or at follow-up visits (mean 6 studies/infant). All survivors have been followed for 12-24 mos (mean 18 mos).

All infants with normal outcomes (n = 25) had recordable SEPs within the first week, most (20/25) had normal SEPs within this period. Infants who died (n = 11) or were severely abnormal (n = 5) had abnormal SEPs, ranging from abnormal morphology to absent. Four of the infants with mild abnormalities on follow-up (n = 6) had abnormal SEPs. Unlike VEPs, SEPs did not normalize in the first three to six months of life, although improvement was seen in the first week in 7 babies who all did well. The SEP findings were not consistently related to the degree of asphyxia the infants suffered (mild, moderate or severe). SEPs have some prognostic utility but compared to earlier work on VEPs, the SEPs were found to be more variable during the critical first week of life and a less accurate indicator of neurological outcome.

4.

Correlation of *CT* and *PET* Scans with Outcome in Neonatal Hypoxic-Ischemic Encephalopathy

S.D. LEVIN, E.S. GARNETT, C. NAHMIAS and J.C. SINCLAIR (Hamilton, Ontario)

Twenty-one infants ≥37 weeks gestation with risk factors for intrapartum fetal distress, low Apgar scores (≤3 at 1 minute or ≤5 at 5 minutes) and encephalopathy had CT and PET scans done in a prospective study to determine their usefulness in predicting outcomes.

CT scans were done at 9-20 days of age except in four cases, when clinical concerns overrode study considerations. PET scans were done within 24 hours of CT scans. Outcome was predicted to be good on CT scan if low attenuation was confined to frontal and/or parietal white matter and/or the centrum semiovale and to be poor if low attenuation involved cortical grey matter and/or basal ganglia. The distribution of glucose metabolism was determined by PET scanning with ^{18}fluorodeoxyglucose (^{18}FDG). A good outcome was predicted if the distribution of glucose metabolism, CMR_{glu}, was symmetrical between hemispheres and if CMR_{glu} was relatively increased in the sensorimotor cortex and thalami. Poor outcome was predicted if the distribution or CMR_{glu} was asymmetrical or if focal areas of increased or decreased metabolism were present.

CT scans showed a positive predictive value of 83%, and a negative predictive value of 87%, sensitivity 71% and specificity 93%, whilst PET scanning showed a positive predictive value of 67%, negative predictive value of 80%, sensitivity 57% and specificity 86%. These values contrast with prediction based on 5 minute Apgar scores (positive predictive value 43%, negative predictive value 86%) and Sarnat encephalopathy stage (positive predictive value 43%, negative predictive value 86%).

We conclude that CT scans are useful in predicting outcome. The predictive values of PET scans may be further increased if a quantitative technique is used.

5.

Useful Prognostic Features for Longterm Survival in Newborns with Muscle Disease

M.B. CONNOLLY, E.H. ROLAND and A. HILL (Vancouver, British Columbia)

Disorders of muscle which present in the newborn period often raise serious ethical dilemmas, especially in terms of provision of longterm ventilation. Although the outcome may be predicted with reasonable accuracy when a precise histological diagnosis is available, the histological interpretation of a muscle biopsy may be inconclusive. In such instances, clinical features play a major role in management.

The purpose of this study was to identify clinical features which are predictive of longterm survival in newborns with muscle disease. The study population comprised all newborns with muscle disease (16) admitted to British Columbia's Children's Hospital between 1983 and 1989. The obstetrical and neonatal course, muscle biopsy, autopsy data and outcome were reviewed. Clinical features and histological data were correlated with longterm survival.

Definitive diagnosis of muscle disease was made on the basis of family history (7 infants); muscle biopsy in the newborn (1 infant); delayed or repeated muscle biopsy (3 infants); autopsy (5 infants). Five infants survived beyond one year of age.

Clinical variables which were similar in infants who died before one year and in those who survived were: polyhydramnios, decreased fetal movements, hypotonia, Apgar scores and maximum ventilation pressures. In contrast, infants who died before one year and had an increased incidence of arthrogryposis (8/11) and multiple congenital anomalies unexplained by fetal inactivity (3/11). Infants who died were of lower gestational age (mean: 30 weeks, range: 29-39 weeks) than those who survived (mean: 36.8 weeks, range: 35-40 weeks). Five of the 11 infants who died had pulmonary complications of prematurity, e.g., respiratory distress syndrome, bronchopulmonary dysplasia. The duration of mechanical ventilation was longer in infants who died (mean: 45.6 days, range: 3-120 days) than in infants who survived (2 infants required oxygen therapy only; in the remainder, mean duration of ventilation: 15 days, range: 10-21 days).

In summary, this study identifies clinical features which may be useful for prediction of longterm survival in newborns with muscle disease. These include gestational age ≥35 weeks, and a brief duration of mechanical ventilation (<21 days). Pulmonary complications, other congenital anomalies and severe arthrogryposis suggest a poor chance for survival. Delayed or repeated muscle biopsy may be of value for provision of precise histological diagnosis.

6.

Eight-Year School Performance of Term Infants Who Have Had Neonatal Convulsions: A Comparative Study

C.M.T. ROBERTSON, S.A. KARA and M.G.A. GRACE (Edmonton, Alberta)

Neonatal convulsions have been accepted as a measure of perinatal outcome in relation to major childhood physical and mental disabilities. Does this suggest that children who have had neonatal convulsions are more likely to have delayed school performance than Neonatal Intensive Care Unit (NICU) graduates without convulsions or encephalopathy, and than their school peers?

From 1974-79, 172 term neonates with convulsions and without syndromes or malformations were identified in a prospective study of NICU patients. In-hospital mortality was 12%, post-discharge mortality to 8y was 6%, disability at 8y (83% follow-up of survivors) was 20%. One hundred and sixteen study children, 67 neonatal comparison and 155 comparison peer-group children received psycho-educational assessments at 8 years of age.

No significant differences existed between the three groups on gender and social variables including parents' education and socio-

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economic index. Intelligence quotient for the study group (94 ± 23) was significantly below neonatal (107 ± 16) and peer (112 ± 13) groups ($p < 0.0001$). More children in the study group were >1 grade delayed for school performance than either of the other groups: reading 41% *vs* 19% and 16%, arithmetic 35% *vs* 25% and 12%, spelling 25% *vs* 16% and 8%, 1 or more of above 47% *vs* 30% and 19% respectively ($p<0.001$). Significant differences ($p<0.01$) persisted when children without disabilities were compared.

Convulsions in full-term neonates identify children "at risk" for reduced school performance.

Movement Disorders

7.

Treatment of Refractory Parkinson's Disease with Adrenal Medulla Tissue Autografts Utilizing Two Stage Surgery

K.C. PETRUK, A.F. WILSON, D. SCHINDEL, N. WITT, D.R. McLEAN, N.B. REWCASTLE, W.R. MARTIN and D.B. CALNE (Edmonton; Calgary, Alberta; Vancouver, British Columbia)

We report our experience with the two stage adrenal medullary autograft program for the treatment of refractory Parkinson's disease (PD) in five patients. Two year follow up studies in four of five patients included: serial clinical and neuropsychological assessments, implantation site blood brain barrier studies and functional 6FD-PET and 6DG-PET scanning studies.

The primary objectives of the two stage transplantation surgical procedure were to slow or inhibit the progressive nature of PD and to provide long term clinical benefit. The effect of factors such as duration and severity of PD, quality and quantity of adrenal medulla tissue implanted, pre-operative 6FD-PET scan results and the pre-implant caudate conditioning lesion on ultimate clinical prognosis were analyzed.

One patient died seven months post-transplantation of undetermined causes. Neuropathological studies of the graft site area tissue revealed viable capillaries and adrenal medullary cells. Further histological studies continue and these findings will be discussed.

Clinical results (based on the Unified and Modified Columbia Parkinson's rating assessment scales and private diaries) and correlative 6FD-PET study data will be presented. The blood brain barrier at the site of implantation was found to be defective for the period of study. This feature may have significant clinical implications for new therapeutic strategies.

8.

Specificity of Levodopa Response in Parkinson Syndrome

A.H. RAJPUT, B. ROZDILSKY, A. RAJPUT and L. ANG (Saskatoon, Saskatchewan)

Striatal dopamine (DA) deficiency is the main chemical basis of Parkinson syndrome (PS) clinical manifestations. Levodopa (LD) is the precursor of DA and is the major drug in the treatment of PS today.

The PS is a heterogenous group but idiopathic (Lewy body) Parkinson's disease (IPD) accounts for approximately 80% of the cases. A favourable response to LD in most large PS series ranges around 80% of cases. Hence it has been postulated that an improvement on LD is indicative of IPD. We report our 21 year clinical and pathological observations to verify that hypothesis.

Improvement in PS on LD was measured as reduction in the disability by one stage or more in advanced cases (Stages III, IV and V) or continued mild disability for several years in early PS cases (Stages I and II, Hoehn and Yahr) on LD.

Sixty-one cases came to autopsy. The initial diagnosis of IPD was accurate in 68% and the final IPD diagnosis was verifiable in 81% cases. The improvement on LD was noted in 78% IPD (without dementia); in 60% cases with IPD plus Alzheimer's disease and in 40% of multiple system atrophy cases.

Our data indicate that LD's therapeutic efficacy is not specific for IPD and errors in clinical diagnosis of the underlying pathology are substantial.

We recommend that all PS cases that are functionally handicapped be given a trial on LD and other anti-parkinsonian agents.

9.

Preclinical Detection of Nigrostriatal Dopaminergic Dysfunction in a Kindred with Familial Parkinsonism and Essential Tremor

M. GUTTMAN, G. LEGER, H. KUWABARA, G. FRANCIS and A. GJEDDE (Montreal, Quebec)

Parkinsonism is associated with severe dopamine depletion in the nigrostriatal pathway. *In vivo* detection of lessor degrees of dopamine depletion may identify subjects at risk of developing symptomatic parkinsonism. Asymptomatic individuals within kindreds of familial parkinsonism and subjects with essential tremor (ET) have been reported to have a higher risk of developing parkinsonism compared to the general population. We performed 6-[^{18}F]fluoro-L-dopa (6-FD) positron emission tomography (PET) studies in a kindred with a combination of familial parkinsonism and ET to identify preclinical nigrostriatal dysfunction.

Five subjects had 6-FD PET scans and MRI for PET/MRI correlations. Subject 1, male age 77, had longstanding ET and developed parkinsonism at age 73. His daughter, subject 2 age 53, was initially diagnosed as having ET and then developed parkinsonism at age 50. All 3 children of subject 2, male age 23, female age 27 and female age 29, have ET. PET studies were compared to 4 control subjects. Tracer kinetic analysis of cerebral and plasma radioactivity after 6-FD administration was performed to estimate K_3 which is thought to represent regional dopa decarboxylase activity. The control subjects had average striatal values of 0.044 min^{-1}. The 3 at risk subjects had values of 0.042, 0.05 and 0.026; identifying subject 5 with subclinical reduction of nigrostriatal function. Preclinical identification of subjects at risk of developing parkinsonism with 6-FD PET scans may permit the evaluation of therapy with MAO-B inhibitors to retard progression to clinical symptoms.

10.

Botulinum Toxin in Persistent Dystonia of the Hand

M. BHATT, J. TSUI, B. SNOW and D. CALNE (Vancouver, British Columbia)

We present the results of our pilot study, on the use of botulinum-A toxin injection for patients with persistent hand dystonia.

Six patients with hand dystonia causing marked functional incapacities were selected for this study. Two patients were in stage 3, and 4 patients were in stage 4 on a dystonia rating scale (Fahn and Marsden; rating from 0 to 4). Excessive flexion at the wrist and/or fingers was frequent and there was often pronation of the forearm. Muscles for botulinum injection were selected clinically taking into account accessibility, and the extent of involvement in abnormal activity. A mean dose of 132 mouse units (75-260) of botulinum toxin was injected in divided doses. The muscles injected included flexors of the wrist, pronators of the forearm and flexors of the fingers. All patients showed improvement on their functional rating scale. Three patients with stage 4 improved to stage 3 and two patients with stage 3 improved to stage 2. There were no side effects and results were reproducible 3 times in 3 patients and twice in 2 patients. We concluded that botulinum toxin is effective for symptomatic relief of PERSISTENT dystonia of the hand.

11.

Autosomal Recessive Spastic Ataxia of Charlevoix-Saguenay (ARSACS) Is Not Linked to the Friedreich's Ataxia (FA) Region of Chromosome 9

A. RICHTER, S.B. MELANCON, K. MORAN, J. POIRIER, J. MERCIER, R. ROZEN, F. GOSSELIN and J.P. BOUCHARD (Montreal; Quebec City, Quebec)

ARSACS, a unique, homogeneous form of spastic ataxia is observed with high frequency (1 in 1,000 to 2,000) in the Charlevoix-Saguenay region of northeastern Quebec. Clinical characteristics include spasticity, dysarthria, distal muscle wasting, truncal ataxia, absence of sensory evoked potentials in the lower limbs and very specific retinal striations.

ARSACS displays some similarities to FA, both forms of ataxia have autosomal recessive inheritance, however the conditions are clearly separate clinical entities.

In contrast to the restricted occurrence of ARSACS, FA is distributed worldwide. The biological cause of either form of progressive ataxia is unknown. FA has recently been mapped to chromosome 9q13-q21 using genetic linkage analysis and *in situ* hybridization with polymorphic DNA markers.[1,2]

Our aim is to find the chromosomal location of the ARSACS gene and its eventual isolation. We performed linkage analysis on 9 multiplex ARSACS families using chromosome 9 markers from the FA region.

Among the 94 individuals studied, 25 are affected. We excluded ARSACS (locus A) from the pericentromeric region of chromosome 9 by multipoint linkage analysis using the polymorphic DNA markers D9S15 (locus M), D9S18 (locus H) and the LINKAGE computer program.[3] For the locus order A-H-M and H-M-A we obtained LOD (log base 10 of odds ratio for linkage) scores of –2.3 and –2.8, respectively. (A LOD score of –2 or less is significant evidence against linkage.) ARSACS has also been excluded from between the two marker loci (LOD –10.8). With the use of two other markers, D9S1 and D9S3, we have effectively ruled out a large portion of chromosome 9 (short arm and proximal long arm) from containing the gene responsible for ARSACS. Linkage studies are now under way using polymorphic markers from chromosomes 7 (cystic fibrosis region), 11 (catalase) as well as markers from regions implicated in other forms of progressive neurological disorders (OPCA, Charcot-Marie-Tooth disease).

[1]Chamberlain, et al. Nature 1988; 334: 248.
[2]Hanauer, et al. Am J Hum Genet 1990; 46: 133.
[3]Lathrop and Lalouel. Am J Hum Genet 1988; 42: 498.

12.

Rett Syndrome and the EEG: The Devil Finds Work for Idle Hands

J.E. WARK, A. HUNJAN, E. SHAHAR and P. HWANG (Toronto, Ontario; Tel Hashomer, Israel)

We reviewed 27 EEG's of 11 girls with Rett Syndrome, aged from 2 years, 3 months to 19 years. Seven patients had 2 or more records; five EEG's in 4 patients were performed with EEG telemetry, and 3 of these in 2 patients showed ictal changes.

Previously described Rett patterns observed include central spikes as an early feature of the disease, a deterioration of the background leading to monotonous slowing, paroxysmal generalized spikes, a rhythmic slow spike and wave pattern, and a psuedo-periodic pattern similar to that seen in SSPE. The paroxysmal features were strikingly activated in sleep. While deterioration of the EEG seems to parallel the patients' clinical course, we note with particular interest a reactive posterior dominant alpha rhythm in a nineteen-year-old stage IV patient. Another important observation was the abolition of paroxysmal features and improvement of the background after treatment with the ketogenic diet.

Previously unreported observations include evidence of a time-locked relation between central spikes and sterotypic hand movements; we also show instances in which suppression of the movements is associated with the onset of a rhythmic 3-4 Hz spike and wave pattern, correlating with atypical absence seizures. In addition, we noted paroxysmal generalized fast activity followed by suppression of the record, which correlated with a tonic seizure pattern.

The EEG is vital not only to the diagnosis, but to the management of Rett Syndrome, whose epileptic symptoms are too often neglected. Video telemetry is particularly useful in this instance. Our finding of a correlation between EEG features and stereotypic hand movements may lead to a better understanding of this striking movement disorder aspect of the condition.

Neurosurgery

13.

Comparison of CT Contrast Enhancement and BUDR Labelling Indices in Moderately and Highly Anaplastic Astrocytomas of the Cerebral Hemispheres

M.W. McDERMOTT, H.G. KROUWER, A. ASAI, M. PRADOS and T. HOSHINO (San Francisco, U.S.A.)

Computed tomography (CT) has been used for more than 10 years to image the brains of patients with suspected intracranial gliomas. The presence of contrast enhancement (CE) has been assumed to be indicative of a defect in the blood brain barrier and increasing histologic malignancy. The presence of CE, while saying nothing about the proliferative potential of a tumor, none the less has been used in directing therapy. The BUDR labelling index (LI) that can be obtained from biopsy specimens, is an index of the proliferative potential of astrocytomas and correlates with both histologic malignancy and survival. For low grade tumors a LI < 1%, and for malignant tumors a LI < 5%, are associated with a significantly better survival as compared to those tumors with higher LI values. To determine if there was any correlation between CE on CT and BUDR LI a retrospective study was undertaken.

The CT scans of 37 patients with moderately anaplastic (MOAA) and 35 highly anaplastic (HAA) astrocytomas of the cerebral hemispheres, for whom BUDR LIs were available, were reviewed. CE was present in 37.8% (14/37) of MOAAs and 71.4% (25/35) of HAAs. 39% of non-CE MOAAs had a LI ≥ 1% and 78.6% of CE MOAAs had a LI < 1%. 44% of CE HAAs had a LI < 5% and 10% of non-CE HAAs had a LI ≥ 5%.

These results indicate that CE on CT scans may not correctly predict the proliferative potential of low and high grade astrocytomas of the cerebral hemispheres and support the recommendation for biopsy and labelling studies of these tumors prior to therapy.

14.

Stereotaxic Radiosurgery in the Palliative Treatment of Cerebral Metastatic Tumors

J-L. CARON and L. SOUHAMI (Montreal, Quebec)

We have used a modified dynamic linear accelerator under stereotaxic condition (modified Leksell OBT frame-Tipal Instruments Inc., Montreal, Que., Canada) to treat seven (8) metastatic cerebral lesions. The aim of the treatment is to give a single dose of 2000 to 3000 cGy limited to the field of the tumor as determined by stereotaxic CT scanning and computer localization of the lesion of interest. The fields treated were limited to a maximum diameter of three centimeters in diameter with 90% of the dose given within the calculated pre-determined perimeter. This preliminary trial was to evaluate the response rate of the various lesions and the effect to the surrounding cerebral tissue of the high dose radiation as evaluated by serial post-operative CT scanning. No attempt at determining the effects on survival rates was made. Of the 8 lesions so treated in 7 patients, all showed at least a partial response to the therapy by a substantial reduction in size and in one case the lesion totally disappeared on follow-up CT scan at 6 months.

All procedures were done under local anesthesia and most performed on an 'out-patient' basis. There was no complication directly attributable to the treatment but one patient had a series of convulsions a few weeks following radiosurgery. It seems that this technique is of potential benefit to many patients suffering from solitary metastatic brain tumors of small dimension in whom palliative treatment is desirable.

15.

Stereotactic Radiosurgery

M.L. SCHWARTZ, C. YOUNG, P. DAVEY, P. O'BRIEN, B. GILLIES and R. McVITTIE (Toronto, Ontario)

The Sunnybrook/Toronto-Bayview Regional Cancer Centre stereotactic radiosurgery facility is based upon a design originally described by Podgorsak in Montreal. The treatment technique is characterized by simultaneous rotation of a linear accelerator couch and gantry with the target located at the isocenter of rotation. Target coordinates are determined and dose contributions are generated using software developed at the Montreal Neurological Institute.

The Sunnybrook system has several unique features. Extensive modifications have been made to the linear accelerator drive systems to allow automatic couch and gantry rotational synchrony regardless of gantry speed. The absorbed dose rate at the target is increased by a factor of 2.8 by removal of the beam flattening filter so that actual treatment time is normally less than 8 minutes. Pretreatment verification of isocentric integrity is routine and a stand-alone electronic interlock system to monitor machine settings has been developed.

To date 9 patients have been treated with our system. The entire procedure including frame attachment, localizing angiograms, CT scans, treatment planning and dose delivery are completed in less than 1 day.

16.

Stereotactic Radiosurgery Using the Gamma Knife: Experience with 414 Cases at the First North American Center

D. KONDZIOLKA, L.D. LUNSFORD, R.J. COFFEY and J.C. FLICKINGER (Pittsburgh, U.S.A.)

We report our experience with stereotactic radiosurgery (Leksell Gamma Knife) in 414 patients. Two hundred and thirteen patients had arteriovenous malformations (AVM); 83 patients had acoustic neurinomas, and 118 patients had other tumors (51 meningiomas, 22 metastatic tumors, 16 pituitary, adenomas, 12 gliomas, 5 chordoma/chondrosarcomas, 4 craniopharyngiomas, 7 other). Indications for radiosurgery included lesions in deep or eloquent locations, unacceptable operative risk or patient refusal of microsurgery, advanced patient age or poor medical condition. Clinical and radiological follow-up now extends to 29 months.

All adult patients underwent stereotactic frame application, computed tomography, angiographic, or magnetic resonance imaging-guided target localization, and radiosurgery under local anesthesia; children under the age of 14 were treated under general anesthesia. The mean age of AVM patients was 33 years (range 2-74). Sixty-seven percent had prior hemorrhage; 28.7% had a seizure disorder; 17.4% had prior surgery; and 19.7% had prior endovascular embolization. Total AVM coverage was achieved in 95% of cases with 98% of patients treated at the 50% isodose or greater (mean marginal dose = 21 Gy). Twelve of 28 patients now at two years post treatment have had angiographic follow-up — nine are obliterated and three are significantly decreased.

The mean age of patients with acoustic neurinomas was 54 years; 18% had neurofibromatosis. Prior surgery had been performed in 20.5%. The mean tumor diameter was 19 mm. Total coverage was achieved in 95% of cases with a mean marginal dose of 18 Gy. Of 56 cases studied to date with CT/MRI, 62% have shown no change in size while 36% have decreased. Complications include delayed temporary facial neuropathies in 15.7%. Useful preoperative hearing status has been preserved in at least 40% of cases at one year. No patient with a meningioma has shown progression within the radiosurgical treatment volume.

We believe that stereotactic radiosurgery has an important *primary* role in the treatment of symptomatic AVM's, acoustic neurinomas, and meningiomas, and can play an *adjunctive* role to surgery or radiotherapy for other tumor types. Our experience indicates that for patients whose advanced age, medical condition, or excessive operative risk precludes surgical excision, stereotactic radiosurgery represents a safe and effective treatment alternative.

17.

Photodynamic Therapy of Malignant Brain Tumours: An Update of 56 Cases

P.J. MULLER and B.C. WILSON (Toronto; Hamilton, Ontario)

We are reporting our experience with intraoperative PDT in 49 patients with malignant gliomas and 7 with metastatic brain tumours; in 39 cases the tumour was recurrent. The age range was 17-73 (mean = 48) years with a male:female ratio of 1.33:1.

Patients received a porphyrin photosensitizer 18-24 hours pre-operatively. A photo-illuminating device, of the author's design, was coupled to an argon dye pump laser in order to deliver light at 630 nm to a tumour cavity created by radical tumour resection and/or tumour cyst drainage. The total light energy delivered ranged from 440 to 450 Joules and the light energy density ranged from 8 to 175 J/cm^2. In 10 patients a line fibre(s) was used to administer interstitial light as a supplement to the cavitary photo-illumination. The additional light dose ranged from 60-945 J/cm. The most recent cases received additional post-operative fractionated light doses via implanted optical fibres. A serious morbidity-mortality rate of 9% was observed.

In the 49 patients with gliomas the death rate per observation year was 0.90 for the interval between PDT and death. The median survival was 8.5 months with a 1 and 2 year actuarial survival rate of 33% and 14%, respectively. In 12 patients a complete or near complete CT scan response was identified post-PDT. These patients tended to have a tumour geometry (e.g., cystic) that allowed complete or near complete light distribution to the tumour. Their median survival was 17.1 months with a 1 and 2 year survival of 62% and 38%, respectively. Also, groups which received higher light doses survived longer than those with lower light doses. Photodynamic therapy of malignant brain tumours can be carried out with acceptable risk. Good responses appear to be related to adequate light delivery to the tumour. Post-operative photoillumination via implanted optical fibres appears to improve light delivery.

18.

Reoperation for Recurrent Malignant Astrocytoma

M. BERNSTEIN, P. MULLER and W. TUCKER (Toronto, Ontario)

The authors conducted a retrospective review to re-examine the value of second operation for patients with malignant astrocytoma. The experience of three University of Toronto neurosurgeons was collected. Eligible patients were those who were reoperated for recurrence of a previously treated malignant astrocytoma (i.e., grade III and IV astrocytomas). Patients who were reoperated more than once and those receiving any form of experimental therapy after repeat craniotomy were excluded.

The study population was comprised of 50 patients of median age 51.5 years. There were 32 males and 18 females. Thirteen were originally treated for a grade III astrocytoma and 37 for a glioblastoma multiforme (i.e., grade IV tumor). All patients were originally treated with craniotomy and external radiation (50 Gy/25 fractions via parallel opposed regional fields). All patients had Karnofsky performance status of 50 or greater at time of second operation. Median interval between first and second operation was 38 weeks. As of January 1990, 39

patients are dead and 11 remain alive. Median survival following repeat craniotomy calculated by the product limit estimate method is 19.5 weeks. Complication rate of second craniotomy was 10% (4 patients developed infective complications and 1 incurred worsening of a previous hemiparesis).

Based on this limited review, we conclude that second craniotomy alone for recurrent malignant astrocytoma confers a modest prolongation of survival with reasonable preservation of quality of life. Patients who satisfy the clinical and surgical criteria for second craniotomy for recurrent malignant astrocytoma should as well be offered some form of experimental therapy.

Neurobiology

19.

Structural and Functional Analysis of a New Neurotrophic Molecule

P.M. RICHARDSON, M. ALTARES, R. BENOIT, C. LYONS, G. FLYNN and R. RIOPELLE (Montreal, Quebec; Kingston, Ontario)

CNTF (ciliary neuronotrophic factor), named for its actions on parasympathetic neurons in tissue culture, was discovered and partially characterized one decade ago. The 23 kilodalton protein has now been purified to homogeneity from 2000 rabbit sciatic nerves and shown to be half-maximally bioactive at approximately 10 picomolar concentration. Partial amino-acid and nucleic-acid sequencing has been obtained from trypsin digests and use of the polymerase chain reaction. CNTF is relatively concentrated in peripheral nerve at approximately 300 ng/gm, 100-fold more abundant than NGF (nerve growth factor). Radioiodinated CNTF has been shown to bind to a putative receptor on ciliary neurons but not to be internalized and retrogradely transported in ciliary axons. In addition to its previously reported actions on parasympathetic and sympathetic neurons, CNTF appears to promote survival and neurite outgrowth for a subpopulation of large spinal neurons.

In structure, mechanisms of action, and spectrum of responsive neurons, CNTF differs strikingly from NGF.

20.

Astrocytes Maintained in the Presence of Soluble Mediators of Inflammation Produce Inhibitors of Immobilized Neuronal Growth Factors

R.J. RIOPELLE, P.C. JOHNSON-GREEN and K.E. DOW (Kingston, Ontario)

Astrocyte-enriched cultures release molecular species that complex to laminin and promote neurite growth *in vitro*. When astrocyte-conditioned medium (ACM) was coincubated with glycosaminoglycans (GAG's) of heparan sulphate (HS) on laminin substrate, neurite growth was no different than on laminin alone, suggesting that heparan sulphate proteoglycans (HSPG's) in ACM were critical to the neurite-promoting activity of CM. When astrocytes were cultured in the presence of interleukin-1, the conditioned medium (IL-1/CM) had a titre of laminin-complexed neurite-promoting activity that was 50% of ACM, while the conditioned medium produced by astrocytes in the presence of 20% macrophage-conditioned medium (MCM) (MCM/CM) or lipopolysaccharide endotoxin (LPS) (LPS/CM) had less than 10% of the laminin-complexed neurite-promoting activity of ACM. Biosynthetic studies revealed that proteoglycans produced by astrocytes and released to CM were qualitatively and quantitatively similar in ACM, MCM/CM and IL-1/CM, and thus, alterations of proteoglycans, could not explain the differences in the biological activity. When a 50-50 mix of ACM and MCM/CM was used to pretreat the laminin substrate, neurite growth was no different than on laminin pretreated with MCM/CM alone, and approximately 50% of that observed with ACM was used to pretreat the laminin substrate. These observations suggest that HSPG's and/or neurite-promoting factors complexed to HSPG in ACM are prevented from interacting with laminin as a result of exposure to soluble mediators of inflammation because these mediators stimulate production of inhibitors by astrocytes. The present studies may begin to address a molecular basis for failure of the astrocyte milieu to support regenerative neurite growth following injury to the CNS.

(Supported by MRC Canada and the Rick Hansen Man in Motion Legacy Fund)

21.

A "Black Box" Approach to Testing Putative Neurotrophic Factors in Regenerating Sciatic Nerve

K. HARMAN, J. KATNICK and J.C. de la TORRE (Ottawa, Ontario)

A nerve guide tube technique was used to test neurotrophic factors on nerve rate/density of axonal outgrowth after transection. Sprague-Dawley rats were anesthetized, the sciatic nerve was exposed bilaterally and anchored to a U-shaped 1 cm long PE 280 catheter with four 9-0 nylon sutures. The nerve was sprayed for five seconds with a coolant spray to render it firm and transected with a razor blade. The resulting 2 mm interstump gap was filled with collagen matrix (control) or collagen matrix plus a selected neurotrophic factor: leupeptin; IL-2; 4-aminopyridine; glial maturation factor or lipid angiogenic factor. The catheter was covered by a canopy to ensure stability of the preparation, the incision was closed and the rat allowed to recover. After one month, rats were anesthetized and perfused, the nerves were moved, processed and embedded in araldite resin. Thin (0.5 μm) cross-sections were cut and evaluated under a light microscope. The number of axons distal to the interstump gap were quantified using a computer-assisted technique.[1] Our preliminary results reveal that this black box approach is an effective technique for evaluating *in situ* putative neurotrophic factors. Findings reveal different rates and/or densities of axonal outgrowth after transection and treatment.

(Supported by the Easter Seal Research Institute of Ontario)

[1]Harman, et al. Soc Neurosci Abstr 1989; 15: 884.

22.

Neurotoxicity From Chronically Applied Direct Current Fields

R.J. HURLBERT, C.H. TATOR and E. THERIAULT (Toronto, Ontario)

Since 1946, it has been known that small electrical fields significantly influence the growth and development of neurons. Recently, our laboratory demonstrated that the application of a 14 μA Direct Current (DC) electrical field to the injured rat spinal cord significantly improved outcome as measured by behavioral, electrophysiological, and histological techniques. However, attempts to use larger currents resulted in high mortality due to gross changes at the anode. We report our preliminary results of the application of DC fields to the normal rat spinal cord.

Twenty-four adult female Wistar rats underwent T1/T2 laminectomies and epidural implantation of DC stimulators with a variety of intensities ranging from 0 to 50 microamperes (μA). The recovery period lasted from two to twelve weeks and included twice-weekly behavioral assessment using the inclined plane technique. Following sacrifice the spinal cords were harvested and inspected grossly and microscopically for pathological changes. With electrode surface areas of 2 sq. mm separated by 10 mm, damage to the underlying spinal cord was evident with currents as low as 7 μA. Therefore, before this technique can be applied to human patients, the harmful effects of small direct current fields on nervous system tissue must be well defined. Further studies in animal models are essential.

23.

The Role of Lipid Peroxidation and Polyamine Accumulation in Late Delayed Radiation Injury of the CNS

M.W. McDERMOTT, P.H. GUTIN, K.A. LEVIN, P.H. CHAN, N. HOOPER, J. CASHMAN and L.J. MARTON (San Francisco; Berkeley, U.S.A.)

Attempts to improve the local control of malignant gliomas with increasing doses of radiation, has been limited by the problems of demyelination, white matter necrosis and vasogenic edema. Long term steroid therapy is the only available treatment.

In a spinal cord model of late delayed radiation injury in F344 rats, the role of lipid peroxidation was investigated by: (1) measuring the accumulation of malonaldehydes and HETEs; (2) measuring the consumption of endogenous free radical scavengers, vitamin E and C; (3) assessing the effect of long term dietary supplementation and depletion of vitamin E on the radiation dose required to paralyze 50% of the animals (ED50). None of these investigations provided any evidence that lipid peroxidation is important in the genesis of late delayed radiation injury. Chronic vasogenic edema may be a factor in the demyelination of radiation injury. Polyamine (PA) accumulation has been associated with edema seen after cold injury to the rat brain. Putrescine (Pu) and spermine levels were significantly elevated at 4 months post-irradiation as compared to unirradiated controls ($P < 0.001$). The water content of irradiated cord rose abruptly at paralysis. DFMO, a PA inhibitor, given at a dose of 500 mg/kg I.P., Q12H × 2, to paralyzed animals significantly reduced Pu levels ($P = 0.005$). Chronic administration of DFMO to unirradiated rats has showed significant reductions in Pu levels. These results suggest that PA inhibitors may be an alternative in treating the edema of radiation injury and may improve CNS radiation tolerance. Experiments to investigate this are underway and will be reported.

24.

The Response of Prefrontal Cortical Neurons to Noxious Tail Pinch is Blocked by the Electrical Stimulation of the Median Raphé Nucleus in Anesthetized Rats

R. GODBOUT, J. MANTZ, A-M. THIERRY and J. GLOWINSKI (Montreal, Quebec; Paris, France)

A subpopulation of neurons of the rat medial prefrontal cortex (PFC) can be driven by peripheral noxious stimulation. Since central 5HT is involved in the modulation of pain signals and since the PFC receives a 5HT innervation from the midbrain raphé nuclei, we have investigated the influence of the median raphé nucleus (MRN) on responses of the PFC to noxious tail pinch.

METHODS: Single unit recording of spontaneously active CPF neurons was performed under stereotaxic control using glass micropipettes in male Sprague-Dawley rats (300 g) anesthetized with ketamine (80 mg/kg). MRN stimulation was achieved with bipolar concentric electrodes delivering square wave pulses of 0.5 ms and 50-150μ A each. Non traumatic noxious tail pinches were applied for 10 s using padded surgical forceps, at intervals not shorter than 2 minutes.

RESULTS: MRN stimulation at 1 Hz totally inhibited the firing of 52.8% of the 210 PFC neurons tested (mean duration of inhibition = 8.2 ± 4.1 ms). The firing activity of 92 neurons was recorded during tail pinch: 29 neurons showed an increase of firing and 5 showed a decrease. Antidromic spikes were recorded in both subgroups of neurons upon MRN stimulation. The activity of 13 neurons inhibited by MRN stimulation at 1 Hz *and* excited by tail pinch was recorded during tail pinch with and without the concomitant stimulation of MRN at high rate (10 Hz). In all cases, the effect of tail pinch was blocked reversibly by MRN stimulation.

DISCUSSION: These results show that the excitatory response of PFC output neurons to noxious tail pinch are blocked by MRN stimulation and suggest that the 5 HT innervation of the PFC may be involved in the modulation of neuronal responses to noxious stimuli in ketamine-anesthetized rats.

(Supported by INSERM and FRSQ)

THURSDAY, JUNE 28, 1990 - P.M.

Neuro-Imaging

25.

MRI in Determining MS Disease Activity in a Clinical Trial

B.L. TANTON, D.W. PATY and D.K.B. LI (Vancouver, British Columbia)

The sensitivity of MRI in detecting lesions of multiple sclerosis (MS), both chronic and acute, has been well established. A prospective two-year serial study of 50 patients with clinical definite (CD), non-disabling relapsing MS is being performed in order to establish the efficacy of high and low dose beta-interferon (BIF) versus placebo therapy. Sequential clinical and biochemical testing and magnetic resonance imaging (MRI) studies are carried out at six-week intervals (and more frequently in the event of a clinical relapse). All investigators' results are blinded from one another during the entire study.

MRI examinations are performed with meticulous attention to uniform patient positioning. Sectional images obtained are analyzed by quantified computerized mapping of lesion area. To minimize inter-observer variation, the mapping is monitored by a single neuroradiologist.

Our previous experience with this type of patient, in which scans were obtained every two weeks, there were 3.1 active scans/patient/year. In the current project where imaging is less frequent, there have been 41 active MRI scans seen in 216 scans in 31 patients who have imaged four or more times. The mean follow-up period has been 10.5 months. Therefore the MRI activity rate is 1.5 active scans/patient/year, concurring with the clinical relapse rate of 1.5 in these same patients.

The purpose of presenting our preliminary data at this stage is to, in a clinical trial setting, examine the relationship between MRI activity and clinical relapse rates. The ability of MRI to portray the pathological location and extent of MS lesions, both in the acute and chronic stages, including a discussion of the patterns, types and location of lesions is to be presented.

26.

Clinical-MRI Correlations in Multiple Sclerosis: A Serial Study Using Quantitative Cranial and Spinal MRI

S. WIEBE, S.J. KARLIK, D.H. LEE, M. HOPKINS, M.K. VANDERVOORT, G.C. EBERS, G.P.A. RICE and J.H. NOSEWORTHY (London, Ontario)

In order to determine the relationship between the MRI changes and the neurological examination in multiple sclerosis (MS) we prospectively studied 32 definite MS patients with quantitative cranial and spinal MRI (pre- and post-gadolinium [Gd]; 1.5 T) at 13 week intervals and during relapses (days 0, 7, 42) over a 6 month observation period. At each visit, the clinician and neuroradiologist (both blinded) judged the disease to be "active" or "inactive" and identified the site(s) of recent disease activity based on the neurological examination and the MRI findings. (MRI activity: new or larger lesion or Gd enhancement). The findings of the 79 follow-up visits were compared with the 32 initial clinical and MRI examinations.

Clinical-MRI agreement on the presence (absence) of recent disease activity was seen in 69% of visits. Using the clinical examination as the "gold standard", the MRI was falsely positive (subclinical new disease activity?) in 21% of the visits and falsely negative in 10%. The sensitivity and specificity of MRI was 75% and 64%, respectively. The addition of spinal MRI increased by 10% the number of scans classified by cranial MRI as "active". Perfect clinical-MRI agreement on disease inactivity and the precise localization of recent events was seen in only 37% of visits. Cranial MRI changes of recent disease activity were seen in the majority of patients suspected clinically of having recently active spinal cord disease (37/42, 88%), although only a minority of these MRI changes were detected by spinal imaging (11/37, 30%).

In view of both the high frequency of clinical-MRI non-agreement and the uncertain significance of these MRI-detected changes, we feel that additional studies of this type are needed to clarify the role of serial MRI in following the natural history and response to treatment in MS.

27.

Multiple Sclerosis Lesion Volume Estimated by 3-D MRI

G.S. FRANCIS, L. BAER, A.C. EVANS and J.P. ANTEL (Montreal, Quebec)

MRI studies have enhanced our ability to detect MS plaques and thus increase diagnostic capabilities. An unresolved issue is the ability to quantitate the volume of brain affected by MS and correlate this measure with clinical parameters. To date studies using 10 mm thick slices have been used to estimate volume of disease.

We investigated the effect of MRI slice thickness upon lesion detectability and quantitative assessment of MS lesion load. We used a 1.5T system to collect high axial-sampled MRI dataset from a chronic MS patient. 64 contiguous 2 mm-thick T2-weighted spin echo (Tr = 2100 msec: T_E = 70 msec) images were collected in 46 minutes. Using a PIXAR 3-D image processing system, adjacent image planes were averaged to yield subsidiary datasets with slice widths of 4, 6, 8, 10, 12, 14 and 16 mm. MS lesions identified in each slice were tagged with maximum voxel intensity. After scalp and marrow signals were deleted, total MS lesion load was determined by integration of all tagged voxels. Striking differences in plaque distribution were apparent even between adjacent 2 mm thick image planes. Contrast between plaque and surrounding brain was maximized at the 2 mm slice thickness and degraded sharply between 4 mm and 8 mm. Image noise was not noticeably worse at 2 mm compared with 4 mm. In thicker slices (8-16 mm) many smaller lesions were no longer apparent. Linear regression analysis of total lesion volume versus slice thickness indicated a 59% reduction at 16 mm compared with 2 mm (correlation coefficient = 0.895). The results indicate that the use of MRI slice thickness of 8 mm or more may substantially underestimate the true extent of MS plaque dissemination.

28.

Usefulness of CT Scanning in Differentiating Dementia of the Alzheimer's Type

A. CARRUTHERS, J. WILLMER, D.A. GUZMAN and D. STUSS (Ottawa; Toronto, Ontario)

CT scan measurements have been disappointing in distinguishing dementia subtypes. We hypothesize that measurements of the temporal horns may be more discriminatory as they may reflect hippocampal atrophy. To address this question, the CT scans of 115 patients assessed at a memory disorder clinic were examined. Patients were classified into groups according to the National Institute of Neurological and Communicative Disorders and Stroke criteria as follows: probable dementia of the Alzheimer type (DAT) (N = 37), possible DAT (n = 23), other dementia (N = 14), normal (n = 41). Scans were done on a GE CT 9800 scanner with a –20° tilt to the canthomeatal line. All scans were blindly examined by the authors. Linear ventricular measurements (bifrontal, bicaudate, third ventricle, ventricular body, temporal horns) were made and expressed as ratios of the brain width at that point. Each scan was scored on a subjective scale (0 = normal, 3 = severe) for various features (ventricular atrophy, sulcal atrophy, hippocampal atrophy, temporal horn size and periventricular lucencies (PVL's)).

Analysis of variance of the brain measurements showed significant difference in all dementia groups compared to normal ($p < 0.001$). Paired analysis of the means demonstrates that, with the exception of temporal horn measures, linear measurements were only capable of distinguishing dementia patients from normals ($p < 0.05$). The temporal horn measurements were better at discriminating between the dementia subgroups. Chi-square analysis of the subjective ratings showed no difference in PVL's, but did show significant difference in all atrophy ratings between demented patients and normals ($p < 0.01$).

These data demonstrate significant atrophy in demented patients, whatever the cause, compared to normal controls. While CT scan measures in general appear to be sensitive for DAT, only temporal horn measurements have the potential to be specific for DAT.

29. **Withdrawn**

Pediatric Neurosurgery

30.

Does Labour and Delivery Traumatize the Neural Placode in Myelomeningocoeles?

D. COCHRANE, K. ARONYK, B. SAWATSKY, R.D. WILSON and P. STEINBOK (Vancouver, British Columbia; Edmonton, Alberta)

Developments in prenatal diagnostic imaging over the past decade have had a significant impact on the treatment options available to families having a child with spina bifida. Despite options for termination, myelomeningocoeles remain the commonest congenital spinal anomaly seen in live born infants. The authors have reviewed patients with myelomeningocoeles treated at the British Columbia's Children's Hospital and the University of Alberta in order to investigate the role of birth trauma in the pathogenesis of the neurological deficit and ambulatory function seen in these children.

208 patients with a myelomeningocoele and who were old enough to demonstrate ambulatory function were selected for study. The medical and obstetrical records were reviewed, all patients reexamined by the authors and all parents interviewed. Data were collected describing the prenatal history, labour and delivery, the neurological examination at birth and at last follow-up, as well as the patient's ambulatory function.

Prenatal accidental or inflicted trauma was not seen in this population. Breech presentation occurred in 23% of pregnancies and was associated with a 1.5x increase wheelchair use for community ambulation ($p = 0.04$). Labour did not add to this increase.

24% of patients delivered from a vertex presentation after labour and 21% of patients delivered by elective Caesarean section demonstrated improvement in neurological function from birth to last follow-up. 50% of patients delivered after breech presentations and labour improved. At last follow-up, there was no difference in the neurological status of these three groups and no difference in their ambulatory patterns.

Breech presentation and labour would appear to result in temporary cord, root or peripheral nerve injury which recovers with time. Elective Caesarean Section does not appear to offer a spinal cord or ambulatory advantage over vertex vaginal delivery.

31.

The Significance of Congenital Posterior Midline Cervical and Cervicothoracic Cutaneous Mass Lesions: Review of Seven Cases

P. STEINBOK and D.D. COCHRANE (Vancouver, British Columbia)

Four to eight percent of cases with spina bifida cystica occur in a cervical or cervicothoracic location. Despite a large body of literature concerning spinal dysraphism, there has been little written specifically about cervical lesions. Seven children who presented at birth with posterior cervical or cervicothoracic lumps, all of which represented a dysraphic state, are discussed. There were two types of abnormalities noted. Five children had a meningocele in which a band of tissue extended from the posterior aspect of the spinal cord through a defect in the bone and fascia to the posterior part of the meningocele sac itself.

The other two patients had hydromyelia with an associated myelocystocele herniating posteriorly into a meningocele sac and in both cases there was an associated Chiari II malformation and hydrocephalus. The investigation and surgical management of these conditions are discussed and the need for intradural exploration to untether the spinal cord in the cervical region is stressed.

32.

Dynamic and Steady State Flow Characteristics of External Ventricular Drainage: Keys to in vivo CSF Shunt Function

J.M. DRAKE, C. SAINTE-ROSE, M. DASILVA and J.F. HIRSCH (Toronto, Ontario; Paris, France)

Very little is known about the in vivo performance of cerebrospinal fluid (CSF) shunts. This information is crucial if new shunt designs, especially those which regulate flow, are to be based upon actual performance requirements, rather than theoretical considerations or estimates of CSF production.

An external ventricular drain (EVD) functions very much like an implanted shunt. Dynamic flow characteristics of EVDs were determined by measuring EVD output using a computer monitoring system. This system recorded the weight of the CSF each second and calculated a flow rate each minute. The activity level of the patients was also recorded. Nine children were monitored for periods up to 9 days. Steady state flow characteristics were determined by reviewing the hospital records of 46 children with EVDs and recording the daily EVD output.

Dynamic changes included wide fluctuations in flow rate, with peak rates frequently greater than 20 cc/hr, and periods of flow arrest. These changes were usually associated with activity, but in one patient occurred with sleep. Steady state characteristics included an average output of all patients of 6.33 cc/hr; EVD output was a function of age, weight, height of the drip chamber, and type of infecting organism. Resolution of the infection, sex of the patient, and method of establishing the EVD had no effect on output.

33.

A Review of Pediatric Spinal Cord Injury in Southern Alberta

M.G. HAMILTON and S.T. MYLES (Calgary, Alberta)

Injury to the spinal column and spinal cord is relatively infrequent in the pediatric population. We present a review of pediatric spinal cord injury in Southern Alberta over a 15 year period. The records of the 3 University of Calgary hospitals that provide neurosurgical care for Southern Alberta were reviewed. Patients 17 years or younger were included if the discharge diagnosis included spinal cord injury with or without fracture.

We identified 76 patients with spinal cord injury. There were 12 patients between 0-9 years of age, 8 patients between 10-14 years of age and 56 patients between 15-17 years of age. There were 3 deaths among these groups. Forty-five (45) of the injuries involved the cervical spinal cord and 31 affected the thoraco-lumbar spinal cord. Sixteen (16) patients had no associated fracture or dislocation identified on radiologic examination. In addition to these 76 patients, we also identified 5 patients with spinal fracture and radiculopathy and 5 patients with a diagnosis of spinal cord concussion.

The etiologic, clinical and radiographic characteristics of this patient population will be reviewed. Special emphasis will be directed to the patients identified with spinal cord injury without radiographic abnormality. Finally, this pediatric patient population will be compared to the pediatric spinal cord injured patients previously described in the literature.

34.

The Effect of Surgery on Sagittal Synostosis

E.W. GAUK, D.L. HILL, V.J. RASO and S.T. MYLES (Edmonton; Calgary, Alberta)

Without surgical intervention, a child with scaphocephaly will develop a long and narrow head shape. Extensive surgery is often advocated to correct this essentially cosmetic deformity. The postoperative suture area remains unfused for only a few weeks so the benefit is most evident in the short term. Our objective was to determine the effect of surgery on the shape and size of these infants' skull. Seven infants with scaphocephaly (5M, 2F), aged 1.5 to 3.5 months at time of surgery, were studied. All had pre-operative CT scans and were followed up to 2 years with MRI scans. Absolute changes in volume, length, breadth and depth as well as shape factors were measured from computerized reconstructions of the serial sections. Age-matched normals and two scaphocephalic infants who did not have surgery served as the control group. Surgery altered the skull dramatically in the immediate postoperative period with size and shape factors indicating a more normal appearance. This improvement did not appear to last, with size and shape factors relapsing to the more scaphocephalic range by the one year follow-up.

Neurosurgery

35.

Automated Percutaneous Lumbar Discectomy: An Alternative to Standard Surgical Lumbar Disc Removal for Radiculopathy

J.-L. CARON (Montreal, Quebec)

Over recent years there has been a tendency towards more conservative approaches to the treatment of lumbar radiculopathies secondary to herniated lumbar discs. Percutaneous techniques have evolved and are currently under investigation by many centers around the world. I will present the results in 50 patients followed for an average of 6 months, 21 of which have been followed for over 12 months using the Automated Percutaneous Lumbar Discectomy (Nucleotome) system (APLD).

Selection criteria include all of the following:

- primary complaint of leg pain greater than back pain.
- failure of 3 months of conservative therapy.
- positive straight leg raising.
- neurological signs of radicular compression allowing to correlate radiological with clinical findings.
- positive CT scan demonstrating a subligamentous contained disc herniation on the clinically affected side and level. Myelography as well as discography have also been used alone or in combination.

The average time of the procedure was 50 minutes and average hospital stay of 6 hours. All procedures were performed under local anesthesia in the ambulatory care facility. There were no complications.

Successes or failures include all of the following criteria:

- No further intervention was needed.
- Radicular leg pain was moderately to completely improved.
- Patient's preoperative functional status must have been improved postoperatively.
- Patient was no longer taking narcotic analgesics for leg pain.
- Patient, surgeon and physiotherapist were satisfied with the results.

Results:

	All Cases (N = 50)
• Success	76%
• Failure	24%

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Conclusions:

- Overall APLD is an effective low risk procedure in adequately selected patients.
- Not very effective in large contained disc protrusions, sequestrated fragments or patients with congenital foraminal stenosis and superimposed disc herniation.
- Can be used as an alternative to micro or standard discectomy and will not jeopardize the result of secondary procedures if they become necessary.

36.

The Relationship Between Somatosensory Evoked Potentials and Blood Pressure During the First 24 Hours Following Acute Spinal Cord Injury

D.A. HOULDEN, C. LI, D.W. ROWED and N. RATHE (Toronto, Ontario; Beijing, China)

After acute spinal cord injury, spinal cord blood flow (SCBF) autoregulation is impaired at the injury site allowing blood pressure to directly affect local SCBF. In our study, two incomplete cervical spinal cord injured patients had their systolic pressure drop from 120 mmHg (mean arterial blood pressure (MABP) = 88 and 95 mmHg) to 80-85 mmHg (MABP = 60, 68 mmHg respectively) 12-13 hours after injury without a concomitant deterioration in their present but abnormal ulnar SSEP's. This finding was surprising because a decrease in blood pressure within their non-autoregulated spinal cords should have caused a decrease in SCBF resulting in SSEP deterioration since a correlation between SCBF and SSEP's has been demonstrated in animals (Fehlings et al, Electroenceph Clin Neurophysiol 1989; 74: 241-259). Furthermore, when their blood pressure returned to 120 mmHg (MABP = 90, 100 mmHg respectively) 1-2 hours later there was no SSEP improvement. Another two incomplete cervical spinal cord injured patients were normotensive throughout the 24 hour recording period and showed no change in their present but abnormal ulnar SSEP's. All four patients had SSEP and neurological improvement several months after injury.

Our clinical study failed to show a relationship between blood pressure and SSEP's within the first 24 hours after spinal cord injury. It is proposed that the patients who became hypotensive without changes in their present but abnormal SSEP's either had some SCBF autoregulation or, if autoregulation was lost, then other mediators of ischemia at the site of injury were more powerful than blood pressure in affecting SSEP's, SCBF and post-traumatic ischemia.

37.

Early Neurological Deterioration After Shunting for Syringomyelia: Clinico-pathological Correlations

E.G. DUNCAN, B.G. BENOIT, M.T. RICHARD, B. LACH and N.A. RUSSELL (Ottawa, Ontario)

Surgical procedures for syringomyelia are usually followed by improvement or stabilization, with a smaller number showing delayed deterioration. There are only 11 reported cases of acute postoperative deterioration, but the incidence is probably higher.

We report 3 cases who deteriorated acutely after different operations: syringo-subarachnoid shunt for a post-traumatic case, syringo-peritoneal shunt for a case with cerebellar dysgenesis and adhesion lysis with syringo-subarachnoid shunt for a case with Chiari malformation.

The acute sensory-motor deficits were unrelated to the myelotomy, and postoperative MR scans were unremarkable. The shunts were not revised.

All 3 patients slowly improved, but one died suddenly of a pulmonary embolus and was subjected to detailed autopsy. The shunt was patent, but chronic arachnoid adhesions tethered the cord to dura preventing syrinx collapse. There was no obvious anatomical substrate in the cord to explain the clinical findings.

Our observations suggest that this complication results from rapid changes in CSF hydrodynamics. If postoperative MR scanning is unremarkable, expectant management is indicated as improvement is likely to occur slowly.

38.

Spinal Fixation Following Anterior Decompression for Symptomatic Spinal Metastases

A.G.E. NORTH, B. NIXON, R.G. PERRIN and R.J. MCBROOM (Toronto, Ontario)

Surgical strategies for the treatment of symptomatic spinal metastases (SSM) must allow for both decompression of the spinal cord and nerve roots, and stabilization of the spinal column.

Our experience with anterior decompression and stabilization for SSM includes 59 patients (24 male and 35 female). Primary sites of tumor origin were: breast, lung, and prostate. Indications for surgical intervention were: local pain, progressive neurologic deficit, and spinal instability. Preoperatively 40 patients were ambulatory, 15 were bedridden, and 4 were frankly paraplegic. Surgical intervention involved anterior cervical (12 cases), transthoracic (37 cases), or trans-abdominal lumbar (10 cases) exposures with vertebral corpectomy and decompression of the dural sac and the nerve roots. Stabilization was secured with a U-shaped stainless steel plate and interposed methyl methacrylate strut.

Postoperatively 41 patients were ambulatory, 49 were improved and 10 were worse.

Complications include: Graft dislodgement, wound infection, respiratory failure, esophageal perforation, coagulopathy, dysphagia, and prolonged air leak.

39.

Technical Considerations in Microsurgical C2 Ganglionectomy for Resistant Occipital Neuralgia

R.D. HOLMBERG (Greensboro, U.S.A.)

A total of 164 patients with occipital neuralgia were seen, followed and treated from November, 1984 until January 1989. In all but 10 cases, or 6%, the condition settled with conservative treatment. In 9 of 10 patients C2 ganglionectomy was elected as the surgical procedure of choice. Average duration of symptoms before surgery 18.8 months. Average time under my care before surgery 13.4 months, with a range of 11 months to 15 months. A video featuring the technical considerations of this operation is presented and in addition, the surgical rationale, anatomy and pathology is also discussed. In addition, indication guidelines for this procedure are discussed and the results from these operations as assessed by a third party neurologist rather than by the surgeon himself was obtained from 8 months to 35 months postoperatively with an average duration of 17.3 months. A brief summary of the operative results will be presented. The conclusion is that for selected case of resistant occipital neuralgia C2 microsurgical ganglionectomy is a safe, effective and rational approach to this condition with minimal morbidity and represents a new application of this technique.

General Neurology

40.

Autonomic and Somatic Neurologic Dysfunction in Impotent Type II Diabetic Men

J.D. STEWART and S. LAL (Montreal, Quebec)

QUESTION: Is sexual dysfunction in type II diabetic males neuropathic in etiology and can this be established by electro-physiological testing?

STUDY: 10 type II diabetic males with sexual dysfunction and no known neurological abnormalities studied prospectively.

RESULTS: *Autonomic symptoms:* Urinary dysfunction 3; bowel dysfunction 1; dry eyes 2; orthostatic symptoms 0. *Somatic symptoms:* Distal paresthesias 2; distal motor weakness - none. *Clinical examination:* Orthostatic hypotension 0. Mild polyneuropathy 3. *Nerve conduction studies* - median and tibial motor; median; radial, sural sensory studies showed abnormalities in 3. Bulbocavernosus reflex (somatic fibers in pudendal nerves) abnormal in 3 (the same patients with abnormal nerve conductions). Bulbocavernosus denervation was not found. *Heart rate* abnormalities on lying-standing and deep breathing were found in 5 patients. *Sympathetic skin responses* were absent in 7 patients (5 had abnormal heart rates). Peripheral vascular disease 1, and borderline penile blood pressures 2; elevated prolactin levels 0.

CONCLUSIONS: Impotence in type II diabetic males is infrequently associated with symptoms and signs of dysautonomia and polyneuropathy. Nerve conduction studies are usually normal, whereas autonomic testing is frequently abnormal (7 of 10 patients). Increasing the sensitivity of these tests and validating these preliminary results with appropriate control groups is a justifiable step in the search for diagnostic tests for neuropathic impotence.

41.

Efficacy of Feedback Training in the Treatment of Long-Standing Facial Nerve Paresis

B. ROSS, J. NEDZELSKI and J.A. McLEAN (Toronto, Ontario)

To date, individuals with long-standing facial paresis as a result of Bell's palsy or post-acoustic neuroma excision do not have available a scientifically documented effective treatment. This prospective study examines the efficacy of EMG biofeedback versus mirror feedback as treatment strategies for patients suffering from long-standing (18 months minimum) peripheral facial nerve paresis. Twenty-five patients were randomly assigned to electromyographic (EMG) biofeedback with mirror retraining or mirror retraining alone. Patients were stratified prior to randomization using the House facial grading scale. Seven patients by virtue of distance from the centre did not undergo treatment and served as controls.

Facial nerve response to maximal stimulation (milli-volts) was measured by standardized electroneurographic methods before, six and twelve months into the study. Maximal facial expressions were quantified by linear measurement of surface anatomic landmarks. Intra-rater reliability of linear measurement of facial movement was previously evaluated. Videotapes of facial movements recording using a standard protocol, were blindly reviewed by independent, experienced appraisers.

The three conditions above (EMG with mirror re-training, mirror retraining alone, and no treatment) with repeated measures at zero, six and twelve months yield 3×3 factorial design and analysis of variance test is used to analyze treatment effect. This study details positive results obtained on 25 patients treated for twelve months with feedback training.

42.

Multiple Sclerosis and HLA Class II Susceptibility and Resistance Genes

D. HAEGERT and G. FRANCIS (Montreal, Quebec)

Probes to the HLA class II genes DRβ, DQβ, and DQα were used to study DNA from unrelated Caucasian multiple sclerosis (MS) patients by sequential restriction fragment length polymorphism (RFLP) analysis. Comparison of 104 patients and 108 controls had identified for the first time a linked series of allele-specific RFLPs or allogenotypes which form an extended haplotype that is preferentially associated with MS. These allogenotypes include DRw15 or DR2 (15), DQβ1b which corresponds at the DNA level to the DQw1 (DQw6) serotype, a DQA1 allogenotype termed DQα1b and a 2.2 kb DX (DQA2) allogenotype termed DXαU (DQA2U). Association of this extended haplotype with MS was confirmed in an analysis of 52 DR-unmatched French Canadian patients and 36 French Canadian controls who together form an ethnically homogeneous subpopulation.

The role of HLA class II genes in susceptibility to MS was found to be complex. First, 23 of 104 MS patients showed DR-DQ linkages which were not observed in our control population and that may be important in the pathogenesis of MS. Second, homozygosity of a 2.0 kb DX (DQA2) gene, termed DXαL (DQA2L), showed a strong negative association with MS both in the total and French Canadian DR-unmatched group. DXαL (DQA2L) is in strong linkage disequilibrium with DR1, 5 (w11), 7 and a subset of DR4 all of which also showed a negative association with MS. Since DXαL (DQA2L) does not code for any known product, DR1, 5(11), 4 and 7 become candidates for disease resistance genes. Third, in EcoR1 and EcoRV digests of DNA from both controls and patients homozygous for DQβ1b a number of different RFLP patterns were identified and these RFLPs were strongly associated with either relapsing-remitting or progressive MS. This suggests there may be HLA sequence differences between individuals bearing a particular class II allele and these may correlate with the clinical course of MS.

43.

A Myelin Basic Protein Antibody Cascade in Purified CSF IgG from Multiple Sclerosis Patients

K.G. WARREN and I. CATZ (Edmonton, Alberta)

The objective of this project was to demonstrate that anti-myelin basic protein (anti-MBP), anti-MBP neutralization and inhibition of anti-MBP neutralization are associated with the purified IgG fraction from CSF of MS patients. CSF obtained from MS patients with acute relapses, in remission and with chronic-progressing disease was characterized for the presence of MBP and anti-MBP. IgG was purified from CSF by affinity chromatography. Anti-MBP was associated with purified IgG from the CSF of MS patients with acute relapses. Anti-MBP neutralizing antibody was associated with purified CSF IgG from MS patients in remission. Anti-MBP neutralization occurred in autologous and homologous experiments. An antibody which inhibits anti-*MBP neutralization was associated with IgG from the CSF of patients* with chronic-progressing MS. Neither of these three antibodies were found in IgG purified from CSF of non-MS controls.

In conclusion, a myelin basic protein antibody cascade located in CSF IgG is associated with the three clinical phases of MS (acute relapses, remission, chronic-progression) and may play a role in the mechanism of this disease.

44.

The Canadian Cooperative Study of Cyclophosphamide and Plasma Exchange in Progressive Multiple Sclerosis

J.H. NOSEWORTHY and THE CANADIAN COOPERATIVE MULTIPLE SCLEROSIS STUDY GROUP (Vancouver, B.C.; Calgary, Alberta; Saskatoon, Saskatchewan; Winnipeg, Manitoba; London, Hamilton, Toronto, Ottawa, Ontario; Montreal, Quebec)

The placebo controlled and blinded 9 centre prospective Canadian Cooperative Study of Cyclophosphamide (cy) and Plasma Exchange (PLEX) in Progressive Multiple Sclerosis (MS) was designed to address the claims that the course of progressive MS could be favorably influenced by both high dose i.v. cy (S.L. Hauser et al, 1983) and oral cy, prednisone and weekly PLEX (B.O. Khatri et al, 1985).

In this 4 year study, 168 patients with rapidly progressive definite

MS (worsening of EDSS ≥ 1.0 in the preceding 12 months; EDSS 4.0-6.5) were randomized to receive either: 1. high dose i.v. cy and oral prednisone, 2. daily oral cy, alternate day prednisone (22 wk.) and 20 weekly PLEX, or 3. double placebo medications and sham PLEX. All patients were examined at 6 monthly intervals by a blinded evaluating neurologist (group 1 single blinded study, groups 2 and 3 double blinded study). At the completion of the trial (December 31, 1989) 1 year follow-up has been obtained on all patients (18 months — 87%, 24 months — 70%; mean follow-up 31 months).

The primary analysis will involve a comparison of the number of treatment failures (decline of ≥ 1.0 points on the EDSS on 2 consecutive examinations separated by 6 months). Secondary analyses will include comparisons of the numbers of patients stabilized, improved and worsened between groups, the number of patients requiring intervention with corticosteroids, mean disability scores, subgroup analyses, etc. The primary and secondary analyses of the results of this study will be discussed in the context of other completed and ongoing clinical trials of experimental MS therapies.

FRIDAY, JUNE 29, 1990 - A.M.

General Neurology

45.

Neurological Complications of Anaesthesia: A Three-Year Prospective Study in a Large Referral Hospital

O. SUCHOWERSKY, C.J. EAGLE and L. STRUNIN (Calgary, Alberta)

Foothills Hospital in Calgary is a tertiary-referral center, where 17,000 general anaesthetics (GA), 460 spinal anaesthetics, and 2,500 epidurals are performed yearly. If patients reported any neurological symptoms following surgery, they were referred by all anaesthetists, to one neurologist (OS) for assessment during 1987, '88, and '89.

Over a 3 year period, 6 patients were referred: 2 following GA, 2 after spinal anaesthesia, and 2 following epidurals. Of the 2 patients with a problem following GA, 1 had clinical and electrophysiological evidence of acute carpal tunnel syndrome which was felt to be due to positioning for a posterior cervical fusion. The second had weakness of the depressor labii inferioris, and numbness of the lip, most likely due to injury of the distal branches of the facial and trigeminal nerves, due to mask placement. One patient, following spinal anaesthesia, developed numbness in the perinanal area, in a S4/S5 distribution. The other had motor and sensory deficits affecting L1, L2, and S3 roots. All deficits improved over several months.

Of the 2 patients thought to have neurological problems following epidural anaesthesia, one had a hysterical paralysis of her legs, and the other had a sciatic nerve palsy due to positioning in the birthing chair.

In conclusion, the apparent risk of neurological complications following anaesthesia is rare. For GA, the risk is 1/25,500, and for spinal anaesthesia, 1/690. We did not detect any neurological problems following epidurals.

Nerve entrapment syndromes, specifically ulnar nerve entrapment, are a well recognized complication of surgical procedures, due to surgical positioning and subsequent bedrest. This may explain why this problem was not reported to us. The acute carpal tunnel syndrome has not been previously reported as an intra-operative problem.

46.

Trileptal (Oxcarbazépine), une solution possible au tic douloureux intraitable et aux effets secondaires de la Carbamazépine

G.M. RÉMILLARD, E. LIKAVCAN, J.-G. VILLEMURE and A. OLIVIER (Montréal, Québec)

Un patient de 63 ans avait été complètement contrôlé d'un tic douloureux durant 10 ans après une rhizotomie rétro-gassérienne au niveau de la protubérance. Son tic douloureux a récidivé mais cette fois avec une zone gachette à VI. Le réflexe cornéen demeurait présent avec une hypoesthésie V2-V3. Tégrétol CR 500mg q.i.d. (niveau 41.8 micromol/libre) était inefficace. Parce que sa douleur persistait depuis 8 mois, le patient était devenu suicidaire et nous avions planifié la résection de la composante de Willis . . . l'article par J M Zakrzewska P N Patsalos Oxcarbazépine: A new drug in the management of intractable trigeminal neuralgia, Journal of Neurology, Neurosurgery and Psychiatry 1989; 52: 472-476, nous incita à tenter le Trileptal avec un soulagement complet quelques heures après l'ingestion de 300mg de Trileptal et un parfait contrôle avec trileptal 300mg t.i.d.

Une patiente de 61 ans avait déjà subi une électrocoagulation 10 ans auparavant. Ses douleurs étaient réapparues et au moment de l'introduction de Trileptal, persistaient depuis 3 mois malgré l'augmentation de Tégrétol CR aux doses maximales tolérées et elle fut référée en neurochirurgie. Trileptal à raison de 300mg q.i.d. la contrôle parfaitement sans effet secondaire.

Une patiente de 78 ans insistait pour diminuer les doses de Tégrétol à cause d'effets secondaires et ses douleurs récidivaient de sorte qu'on avait planifié une thermocoagulation du ganglion de Gasser. Trileptal à raison de 150mg q.i.d. contrôle sa douleur sans les étourdissements et la faiblesse qu'elle éprouvait avec la Carbamazépine.

Trileptal est une alternative possible au traitement chirurgical du tic douloureux.

47.

Proximal Conduction Block in Acute Demyelinating Neuropathies: The Role of Transcranial Magnetic Stimulation

S.J. SIEJKA, G. GIBSON and A. EISEN (Vancouver, British Columbia)

Conventional motor nerve conductions are normal in 15-25% of cases of Guillain-Barre syndrome (GBS). This is true even in the face of significant clinical deficit underscoring prominent proximal (radicular) pathology. F waves and somatosensory (SSEP) studies may then be helpful but these do not readily give measurable evidence of conduction block; the electrophysiological hallmark of acquired demyelinating neuropathies.

In 2 patients with GBS, median and peroneal motor conduction velocities and compound motor action potential (CMAP) amplitudes were normal. In contrast thenar and tibial motor evoked potentials (MEPs) elicited by transcranial magnetic stimulation (TMS) and F waves were delayed. The MEPs were also dispersed and their amplitudes and the MEP wave ratios were much reduced. In association with the other normal electrophysiological findings this indicates proximal conduction block.

TMS is useful in documenting preferential proximal conduction slowing and block in acquired demyelinating neuropathy which may be the only manifestation of conduction block in GBS.

48.

Unusual Clinical Variants of Guilliain-Barre Syndrome

J.Z. WANG (Tianjin, China)

Unusual clinical variants of Guilliain-Barre Syndrome (GBS) that mimic other neurological diseases are demonstrated: (1) constellation of multiple cranial nerve palsies with or without ataxia and areflexia; (2) cerebellar ataxia with little weakness in the legs; (3) paraparesis-like dysfunction preceding by left "Bell's palsy" mimicing spinal cord lesion; (4) severe paresthesias and slight impairment of pain sensation with little weakness in the legs; (5) severe orthostatic hypotension predominating the clinical features. These variants that never progress to typical generalized weakness make the correct diagnosis difficult.

The existence of the time-honoured signs of CNS lesion such as internuclear ophthalmoplegia, cerebellar ataxia, and Babinski's sign may mislead neurologist into suspicion of the CNS involvement in GBS, and challenges the traditional belief of their localizing significance and pathogenetic mechanisms.

49.

Evidence for Increased Reciprocal IA Inhibition in Patients with Spasticity Due to Incomplete Spinal Cord Lesions

R.G. LEE, G. BOORMAN, M. HULLIGER, B.L. MORRICE, K. TAKOU and R. TANAKA (Calgary, Alberta; Tokyo, Japan)

Inhibitory influences on spinal motoneurons were investigated in 8 patients with spasticity due to incomplete cord injuries and in 8 healthy control subjects. H-reflexes were recorded from the soleus muscle following stimulation of the tibial nerve in the popliteal fossa. Conditioning stimuli were delivered to the peroneal nerve at the head of the fibula with the stimulus strength set just at motor threshold, a level sufficient to activate IA afferents arising from the tibialis anterior muscle. The interval between conditioning (C) and unconditioned or test (T) stimuli varied randomly between 0 and 50 msec. Inhibition was detected by expressing the amplitude of the conditioned H-reflex as a percentage of the unconditioned response.

In normal subjects there is a relatively weak short latency inhibition of the soleus H-reflex when the C-T interval is in the 1-2 msec range. This is believed to represent reciprocal inhibition acting via IA inhibitory interneurons. There is also a longer latency inhibition with C-T intervals of 15-20 msec which may represent pre-synaptic inhibition.

In the spinal injury patients, reflex activity was generally increased and in several subjects there was a prominent H-reflex from the tibialis anterior, something which rarely occurs in normal subjects. The short latency IA inhibition was significantly increased in comparison to control subjects with conditioned H-reflexes being reduced by as much as 50% with C-T intervals of 1.5-2.0 msec. The longer latency inhibition obtained with C-T intervals of 15-20 msec was not significantly different from what was observed in controls. The possible significance of these findings in relation to spasticity and impaired motor control following spinal cord injury will be discussed.

50.

Zidovudine (AZT) Induced Myopathy: A Reversible Cause of Weakness and Myalgia in Human Immunodeficiency Virus (HIV) Infected Patients

S.D. CLARKE, B.C. WILLOUGHBY and J.K. HOLDEN (Vancouver, British Columbia)

Six gay HIV positive males developed myalgia (six patients) and proximal leg weakness (five patients) after long term AZT therapy. Creatine phosphokinase levels were normal or mildly elevated and needle electromyography revealed fibrillation in four patients and mild myopathic abnormalities in one patient. Quadriceps muscle biopsy in three patients revealed mild nonspecific myopathic abnormalities on histologic exam and prominent mitochondrial abnormalities on electron microscopy.

All patients improved within eight weeks of stopping AZT and five/six were subsequently able to tolerate a lower dose of AZT.

The clinical course strongly suggests AZT as the etiology of neuromuscular symptoms and effects may be dose dependant. Biopsy results indicate mitochondrial damage may be important in the pathogenesis of myopathy. Further studies are needed to define more completely the clinical spectrum and basic mechanisms of AZT induced myopathy.

Most etiologies of leg weakness in HIV infected patients are not reversible. AZT is commonly used in this population and awareness of it as a cause of myopathy is critical to effective patient management.

51.

Primary Central Nervous System Non Hodgkins Lymphoma (NHL-CNS) in Acquired Immunodeficiency Syndrome (AIDS): Experience with Ten Patients

S.D. CLARKE, R. CRAWFORD and P. HARRISON (Vancouver, British Columbia)

Nine gay men and one woman with blood transfusion related human immunodeficiency virus (HIV) infection developed biopsy (four patients) or autopsy (six patients) proven NHL-CNS. Six patients had an established diagnosis of AIDS prior to development of neurologic symptoms due to NHL-CNS. No patient had evidence of systemic lymphoma.

Cognitive symptoms were the presenting feature in seven patients, obtundation in two, and visual failure secondary to retinal hemorrhages in one patient. Five patients had a gait disorder and four had an early hemiparesis. Headache was not prominent. Seizures occurred in three patients.

Contrast enhanced computed tomography showed multiple lesions with moderate to severe vasogenic edema in seven patients and a single supratentorial lesion in three patients. Periventricular location was frequent. Cerebrospinal fluid (CSF) in four patients showed marked hypoglycorrhachia in three with increased protein and was normal in one. CSF cytology was not diagnostic.

Pathology was large cell lymphoma in four patients, small cell in one, immunoblastic in two, and not classifiable in three. Diffuse brain involvement was usually found at autopsy.

Two patients received whole brain radiation without clear benefit. One patient has had combination chemotherapy (adriamycin, cyclophosphamide, vincristine, bleomycin) followed by brain radiation and is living independently six months after diagnosis. Mean survival in the nine deceased patients from onset of neurologic symptoms attributed to NHL-CNS to death was seventy-one days (range eleven to one hundred and fourty-three days).

Prognosis in NHL-CNS in patients with AIDS is poor. However, there may be a subpopulation of patients who will respond well to therapy and an aggressive approach to diagnosis and treatment in selected cases is warranted.

52.

Primary Lateral Sclerosis: The Clinical and Laboratory Definition of a Discrete Syndrome

C.E. PRINGLE, A.J. HUDSON and G.C. EBERS (London, Ontario)

The existence of primary lateral sclerosis as a distinct entity has been controversial. A review of the modern literature reveals only a handful of communications. We report 8 unrelated patients with chronic progressive spinobulbar spasticity in whom clinical, radiologic and electrophysiologic findings indicate disease confined to the upper motor neurone. Clinical and laboratory features did not support compressive lesions at the foramen magnum or cervical cord, M.S., A.L.S. syphilis, B12 deficiency, syringomyelia or infection. These cases appear to conform to a relatively homogeneous syndrome. Clinical features are characterized by onset in mid-life (mean 45 years) of a slowly progressive, usually symmetrical spasticity of the lower extremities with subsequent involvement of the arms and bulbar musculature. There is sparing of intellect, sensation, oculomotor system, cerebellum, and often of the bladder. All patients progressed to severe spastic dysarthria or to anarthria. Pseudobulbar emotional incontinence was a usual feature. None of our patients had a family history of neurologic disease. The slow tempo of this condition differs greatly from A.L.S., with a mean duration of 19.6 years (range 5-51 years) in this series. We report here that the diagnosis is supported by 1) cerebral MRI scanning which often shows cerebral atrophy with a predilection for the posterior frontal and anterior parietal gyri, 2) magnetic motor cortex stimulation which is consistent with primary cortical neuronal loss, and 3) PET scanning

which shows decreased metabolism of glucose in the pericentral cortex. These 8 patients, along with those few previously described in the literature, represent a distinct, albeit rare, clinical entity with a relatively benign prognosis.

Pediatric Neurology

53.

Cytomegalovirus: The Cause of Rasmussen's Encephalitis

C. POWER, S.D. POLAND, K. KASSIM, W.T. BLUME, J.P. GIRVIN and G.P.A. RICE (London, Ontario)

A viral etiology for Rasmussen's encephalitis (RE) has long been suspected but no direct evidence has been forthcoming, even though it commonly develops in the context of a "viral syndrome" and the neuropathology suggests a microglial nodule encephalitis. Because of the propensity for some human herpes viruses to cause chronic infections of this type, we studied 11 cases of clinically and pathologically confirmed RE for viral DNA by *in situ* hybridization. Sections of paraffin imbedded brain tissue were probed with biotinylated DNA probes for CMV and herpes simplex virus (HSV). Hepatitis B (HBV) was used as a control probe. Control brain tissue was derived from 50 patients who had succumbed to other neurological diseases (trauma, stroke, temporal lobe epilepsy following mesial temporal sclerosis and other viral infections) as well as 27 patients who died of complications of orthotopic liver transplantation.

The light microscopic features of all 11 cases of RE demonstrated microglial nodules, gliosis and perivascular lymphocytic cuffing. Seven of these cases were positive for CMV and none of the cases was positive with the other viral probes. Only 2 of 50 patients with other neurological diseases were positive for the CMV probe ($p = .00004$, Fisher's exact ratio). Ten of the 27 patients with failed liver transplantation were positive. Several of these had had no explanation for an antemortum encephalopathy.

These studies suggest that CMV might play a role in the pathogenesis of RE. We are currently applying gene amplification technology to look for herpes viruses in patients who appear to be negative by *in situ* hybridization techniques. If CMV can be shown to be the cause of most of these cases, new therapeutic strategies might be forthcoming.

54.

Auditory Brainstem Responses in Leigh's Syndrome

M.J. TAYLOR and B.H. ROBINSON (Toronto, Ontario)

There are few reports of auditory brainstem responses (ABRs) in children with Leigh's syndrome, but given the pathological findings of necrosis and gliosis in the pons and midbrain, abnormal ABRs may be expected. Three specific enzyme defects are known causes of Leigh's syndrome. We studied ABRs in 13 children (2 wks - 6 yrs) with Leigh's syndrome in whom the underlying metabolic disturbance was due to pyruvate dehydrogenase (PDH) ($n = 5$), complex one (CX1) ($n = 6$) or cytochrome oxidase (CO) ($n = 2$) deficiencies. Repeat studies were done in 9 children.

All the children with PDH had abnormal ABRs, due to very poor morphology and reproducibility of the waveforms; central conduction time was normal in 4/5 initial studies. The patients with CO had abnormal ABRs also, but due to increased interpeak latencies and low amplitude or absent waves IV/V; reproducibility was normal. 5/6 of the children with CX1 had normal ABRs. The exception (the youngest, 6 wks) had only waves I and II bilaterally. This infant was tested in the ICU and died two weeks later. She suffered from the rapidly progressive form of CX1 deficiency; the other 5 had a slowly progressive form. Repeat studies showed lack of normal maturational changes and, subsequently, deterioration in the ABRs, concomitant with neurological degeneration.

Thus, in distinct enzymopathies leading to the clinical picture associated with Leigh's syndrome, the patterns seen in the ABR appear to be characteristic for each defect, and there is not an ABR pattern characteristic of Leigh's syndrome itself.

55.

Fabry's Disease: Regional Distribution and Immunocytochemical Detection of Globotriaosylceramide in the Central and Peripheral Nervous System

G.A. DEVEBER, N.W. KOWALL, E.H. KOLODNY and G.A. SCHWARTING (Boston and Waltham, U.S.A.)

Fabry's disease is an X-linked glycospingolipid storage disease due to deficiency of alpha-galactosidase. Storage of globotriaosylceramide, maximal in blood vessels, also occurs in selective groups of neurons. We performed detailed neuropathological studies on a 53-year-old man with skin biopsy confirmed Fabry's disease. Luxol fast blue (LFB) - hematoxylin and eosin staining showed multiple microinfarcts and LFB positive deposits in blood vessels throughout the central and peripheral nervous system. LFB positive granular cytoplasmic inclusions were seen in several discrete nuclei throughout the brain, spinal cord, and peripheral ganglia. Prominently affected neurons were seen in the paraventricular and supraoptic nuclei of the hypothalamus, subiculum, basal nucleus of the amygdala, dorsal motor nucleus of the vagus, intermediolateral column of the spinal cord, dorsal root ganglia, and Auerbach's plexus. LFB positive anterior horn cells were present in the spinal cord. Scattered positive neurons were seen in temporal cortex and substantia nigra. Regions adjacent to involved nuclei including the nucleus basalis of Meynert, striatum, globus pallidus and thalamus were completely spared. Ependymal cells and subependymal astrocytes occasionally contained LFB positive material. The adenohypophysis was also involved. Electron microscopy showed typical intracellular inclusions. Staining with a monoclonal antibody raised against globotriaosylceramide (courtesy of Dr. G. Schwarting) showed more extensive involvement than was evident with LFB staining. Globotriaosylceramide accumulation in neurons may result from impaired degradation of endogenous membrane glycolipids or absorption from blood and/or cerebrospinal fluid. The highly selective pattern of involvement we found suggests that glycosphingolipid exposure, uptake, or catabolism varies greatly with respect to neuronal morphology or distribution.

56.

Clobazam is Associated with Fewer Side-Effects Than Other Benzodiazepines in Epileptic Children

R.I. MUNN and K. FARRELL (Vancouver, British Columbia)

Benzodiazepines are associated frequently with neurotoxicity in children. Clobazam is a 1,5-benzodiazepine which is effective in preventing seizures in children. We studied the neurotoxicity in 115 children (average age 8.4 years) who were started on clobazam between September 1982 and March 1989 because of intractable seizures. Mental retardation was present in 79 patients. The majority of patients had secondary generalised epilepsy (82) or partial seizures (28). Most patients had multiple daily seizures and were receiving an average of 2.3 anticonvulsants when clobazam was started. The average dose of clobazam was 0.9 mg/kg/day. Other benzodiazepines were discontinued in 16 of 19 patients receiving nitrazepam and in all 20 patients receiving clonazepam. Changes in attention span, balance, alertness, drooling, appetite, mood and sleeping pattern were reviewed after an average follow-up of 18 months.

Seventy-two percent of patients reported an improvement and 27% a worsening in at least one neurotoxic side-effect after starting clobazam. Patients who discontinued either nitrazepam or clonazepam after starting clobazam had a significantly greater improvement in attention span, alertness, balance, drooling and mood compared to the rest of the group. The greatest improvement was in alertness where 78% of patients who

discontinued a 1,4 benzodiazepine showed a significant improvement compared to 58% of children who were receiving other drugs. There was poor correlation between improvement in side effects and seizure control as measured by both seizure frequency (r = .371) and parental rating of seizure control (r = .261). These data support the clinical impression that clobazam appears to have fewer neurotoxic side-effects than nitrazepam and clonazepam.

57.

Clobazam in Refractory Epilepsy: The Canadian Experience

THE CANADIAN CLOBAZAM STUDY GROUP

In Canada over the last 7 years >1300 refractory epileptic patients were treated with clobazam by 104 adult and pediatric neurologists. 32 who treated >10 patients provided retrospective information about 877 patients with a standard case report form. 51% were children, 49% adults. 38% had mental retardation. 46% had only one seizure type, 54% multiple types with all seizure types represented. Adults had more complex partial seizures, children more atypical absence and myoclonus. Before clobazam patients received 2 (ave) other anti-epileptic drugs (range 0-5). Average dose of clobazam in children was 0.87 mg/kg/day (range 0.05-3.8) in adults 30 mg/day (range 2.5-150). Time on clobazam was <3 months to >48 months, with 40% >12 months. Using Kaplan-Meier curves, it was found that 4 yrs after starting, 40-50% remained on clobazam. 40% of patients with one seizure type had >50% reduction in seizures. 60% with multiple seizure types had >50% reduction in at least one type and 40% in every type. At least 45% of all seizure types except tonic were reduced >50%. 30-35% of primary or secondarily generalized tonic clonic seizures were entirely controlled. Other types ranged from 10-25% complete control. 20% stopped clobazam for poor efficacy, 4.3% for side effects (mainly somnolence) and 8.2% for both. 32% reported possible side effects; only in 11.5% sufficient to stop medication. 17.3% reported some somnolence. 9.2% of patients were reported to develop "tolerance" leading to discontinuation. Nearly all on clobazam for 1 yr continued for 4 yrs. Thus clobazam is useful in refractory epilepsy of all types. A monotherapy trial in less severe epilepsy is now desirable.

58.

Peroneal Neuropathies in Children and Adolescents

A.J. WILBOURN, K.H. LEVIN and P.J. SWEENEY (Cleveland, U.S.A.)

Of patients with peroneal mononeuropathy (PM) studied by EMG between 1978-1989, only 13 were children under 20 years of age. These 13 were grouped into 4 EMG categories: (1) 5 patients had axon loss common peroneal mononeuropathies (CPM) localized between the mid-thigh and fibular head, due to trauma in 4 and perioperative damage in one. (2) 4 had essentially pure deep PM, sparing the superficial peroneal sensory response, due to exostoses at the fibular head in 2 and trauma in one. (3) 2 had CPM localized to the fibular head by conduction block or focal slowing, due to chronic leg-crossing. (4) 2 had CPM localized proximal to the mid-thigh, due to sciatic notch nerve tumor in one and perioperative damage in one.

These findings reflect a tendency to unusual (non-compressive) causes of PM, and correspondingly unusual EMG presentations of PM in the pediatric population, and will be discussed in detail.

59.

Ischemic Stroke in Children

M. KALAPURACKAL, M. LOWRY and N.N.J. SHUAIB (Saskatoon, Saskatchewan)

Ischemic stroke in children is rare and studies with follow-up are infrequent. Therefore we report 13 cases collected sequentially from 1981 to 1989.

Strokes related to trauma, meningitis, hemorrhage, arteriovenous malformations and aneurysm are excluded. In 9 patients no cause was found. In 2 patients the etiology was related to cardiac catheterization and 1 was related to mitral valve prolapse. One has a probable neurocutaneous syndrome. Age at presentation varied from 1 month to 16 years with a mean of 6 years, 6 months. Presentations in 13 patients were as follows: Hemiplegia alone 2, seizures alone 2, hemiplegia and seizures 3, hemiplegia and dysphasia 5, hemiplegia and hemianopia 1.

CT scans were abnormal in all cases. 12 showed infarcts in middle cerebral artery distribution and one showed an infarct in the territory of the posterior cerebral artery.

Serum lipid elevations were seen in 5 patients, in 3 they were transient and likely represent acute phase reactants, in 2 the abnormalities persisted and may be of etiological significance.

Follow-up was from 6 months to 6½ years with a mean of 2½ years. 5 were normal, 5 have minimal motor deficit, 3 have moderate deficit (dysphasia and/or hemiplegia). Overall outcome was good (10/13 normal or minimal deficit). Stroke under 4 years has the best prognosis (4/5 normal, 1/5 behavioral change only).

60.

Capsular Lesions and Hemiplegia in Infants and Children — Electrophysiologic Studies

H.Z. DARWISH and S.T. MYLES (Calgary, Alberta)

In the past two years, two infants and three older children have presented with hemiplegia and were found on CCT to have a lesion of the contralateral internal capsule area.

Angiography was not done. Studies of amino acids, lipid profiles, proteins S and C, and antithrombin III as well as platelet functions have all been negative. It two of the children there was a suggestion a mild head injury closely preceding the onset of weakness.

EEG studies consistently showed absence or marked suppression of sleep spindles on the side of the lesion. In addition there was evidence of absence or suppression of the N19 component of the N19-P22 cortical response to median nerve stimulation, even though late SEP components were totally unaffected.

This particular occurrence of infarcts in the region of the internal capsule in otherwise healthy children remains unexplained.

The electrophysiological studies suggest that inspite of retention of later SEP components the mechanisms of sleep spindle and N19-P22 SEP component generation are shared.

Cerebrovascular

61.

Thrombolytic Therapy of Stroke in a Rabbit Model: The Endothelial Neuroglial Continuum

E. KLIMEK, W.J. MONTANERA, D. FOURNIER, J. GLEN, R. SHARMA and K. TerBRUGGE (Toronto, Ontario)

A method and findings of thrombolytic intervention in acute embolic stroke delivered by transfemoral selective cerebral angiographic procedures is described. Autologous fresh blood clot is selectively injected into the internal carotid artery of the New Zealand White Rabbit (4.0-4.5 kg) using a modified 2.2 F catheter. Hemicerebral perfusion of urokinase (60,000 units) is performed without bleeding from the surgical incision made at femoral arteriotomy. Thrombolytic therapy during the hour after embolization promotes reperfusion but damage to the blood-brain barrier with vasogenic edema is seen in some animals. These pilot experiments indicate that reperfusion by intra-arterial

thrombolytic infusion is feasible, however, neuronal salvage involves reducing damage to the functional continuum extending from the endothelium to the neuroglia.

62.

The Effect of U74006F on Forebrain Ischemia Evaluated with Magnetic Resonance Imaging and Histopathology

H.J. LESIUK, G.R. SUTHERLAND, J. PEELING, D. WILKINS, J. MCTAVISH and J.K. SAUNDERS (Winnipeg, Manitoba; Ottawa, Ontario)

One mechanism of ischemic neuronal injury is free radical mediated lipid peroxidation which may vary in severity in differing brain regions. To probe regional variability in peri-ischemic lipid peroxidation inhibitor, the 21-aminosteroid U74006F, on short-duration forebrain ischemia in rat, was examined. Cerebral ischemia was induced through bilateral carotid occlusion/controlled hypotension (50 torr) for 10 min. Acute treatment rats received either U74006F (3 mg/kg) or carrier *vehicle, iv, 30 min pre-ischemia; sustained treatment animals received* the pre-ischemia treatment as above followed by U74006F (3 mg/kg) or vehicle, iv, every 6 hours for 48 hours. Coronal high-resolution (100 μm) multi-slice, multi-echo magnetic resonance images (MRI) were obtained daily for 3 days. All animals were then sacrificed with histologic examination of perfusion fixed brains. Control animals demonstrated MRI changes indicative of neuronal damage in striatum at 24 hours, followed by changes in hippocampus and neocortex at 48 hours. U74006F had no effect on striatal or hippocampal injury. However, both acute and sustained U74006F treatment produced a significant reduction in the severity of neuronal damage in the neocortex. We therefore conclude that lipid peroxidation is a more prominent mechanism of neocortical injury than of hippocampal or striatal injury. Possible metabolic bases for the observed differences are discussed.

63.

The Response of the Calcium Channel to Cerebral Ischemia

A.M. HAKIM, M. HOGAN and A. GJEDDE (Montreal, Quebec)

In-vitro studies using brain slices and subcellular fractions suggest that calcium channels are activated by hypoxia and cell membrane depolarization. Since cerebral blood flow (CFB) measurements following ischemic stroke do not reliably predict eventual histologic outcome we have investigated the usefulness of *in-vivo* binding of ^{3}H-nimodipine in cerebral ischemia. The distribution of ^{3}H-nimodipine in ischemic brain reached equilibrium within 30 minutes of circulation and binding to ischemic tissue was a saturable and probably specific process.

We then studied the time-course of binding to ischemic tissue and its relation to both CBF and histologic outcome. Male Sprague Dawley rats underwent simultaneous unilateral occlusions of the middle cerebral and common carotid arteries. Five minutes, 4 hours, 24 hours and 48 hours later we determined CBF and regional *in-vivo* binding of ^{3}H-nimodipine in separate groups of rats. At 5 minutes after onset of ischemia, increased nimodipine binding was limited to regions with CBF < 10 ml-100g^{-1}-min^{-1}. By 4 hours these regions showed very low binding while regions with CBF of 10-20 ml-100g^{-1}-min^{-1} (penumbra) showed increased binding. This late activation of nimodipine binding was also observed to decrease slowly over time. Ischemic regions developed histologically evident cerebral infarction when they lost their ability to bind ^{3}H-nimodipine after a phase of activated binding.

Sequential measurements of binding of nimodipine or other calcium channel ligands in stroke patients may be possible using positron emission tomography. Such studies would have the potential to distinguish regions of reversible from irreversible ischemic injury. It would then be possible to monitor the response of tissue to any therapy by measuring the state of activation of its calcium channels.

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64.

MK -801 Reduces Cerebral Infarction: Vaso-active or Cyto-protection

D.X. XUE and A.M. BUCHAN (London, Ontario)

Previous studies showed that NMDA antagonists have consistently produced a reduction in focal infarction but have failed to reliably prevent ischemic neuronal death following global ischemia.[1] These experiments tested the hypothesis that the protective effect in focal models is related to an increase in regional cerebral blood flow (rCBF) rather than NMDA receptor antagonism.

In Wistar rats with a temporary middle cerebral artery occlusion (MCAO) we observed a reduction of cortical infarction from 150 ± 43 mm^{3} (saline, n = 9) to 41* ± 19 mm^{3} (5 mg/kg MK-801, n = 9). Laser doppler flowmetry however showed a relative increase of 300% in rCBF in the core region of ischemia.

In the spontaneously hypertensive rat (SHR) MCAO model, which has less collateral potential, we examined the difference in infarct size *between saline and MK-801 treated animals at 3, 6 and 24 hours* following occlusion, and 22 hours reperfusion after 2 hours ischemia.

Time of Sacrifice		Infarct Volume (mm3 ± SE)	
Occlusion	Reperfusion	Saline	MK-801
2 hour	22 hour	184 ± 12 (n = 8)	160 ± 12 (n = 7)
3 hour		147 ± 4 (n = 7)	126 ± 15 (n = 8)
6 hour		187 ± 6 (n = 7)	141 ± 6 (n = 8)**
24 hour		226 ± 14 (n = 9)	185 ± 11 (n = 10)*

(*p <0.05, **p <0.01)

While there is no difference in rCBF to the core of the SHR infarct, it was significantly higher in the penumbra region. In MK-801 treated rats rCBF was 22 ± 2% (n = 21) while in saline animals it was 10 ± 1% (n = 20)**.

These observations suggest that the cyto-protection seen with MK-801 in focal models of ischemia may be related to vaso-active effects.

[1]Buchan A, Pulsinelli WA. Hypothermia but not the NMDA antagonist MK-801 attenuates neuronal damage in gerbils. Journal of Neuroscience in press.

65.

Role of Carotid Stenosis in Ischemic Stroke

C.Z. ZHU and J.W. NORRIS (Toronto, Ontario)

Most ischemic strokes are associated with either carotid artery disease or cardioembolism, but a large minority remain unexplained. We compared the carotid Doppler results in 261 consecutive patients admitted with carotid ischemic stroke, 803 with carotid TIAs, 500 with asymptomatic carotid bruits and 500 controls to determine the role of carotid disease.

Symptomatic patients with neck bruits had a higher incidence and greater severity of carotid stenosis than the asymptomatic group or than symptomatic patients without neck bruits (p <0.0001). Carotid stenosis was present in 70% TIAs and 86% strokes with neck bruits, but only 23% and 31% (respectively) without bruits. Carotid stenosis was more prevalent and more severe in the stroke group than the TIA group (p <0.025). This difference was not due to differences in age or gender. In controls, 6% had stenoses > 35%, and 1.2% had stenoses > 75%.

Carotid stenosis is present in most patients with TIA and stroke with neck bruits, but is absent in most of those without neck bruits. Most symptomatic cerebrovascular disease is due to causes other than carotid stenosis.

66.

Transesophageal Echocardiography Improves Diagnosis of Potential Cardioembolic Sources in Unselected Stroke Patients

C.L. VOLL, P. POLASEK, B. CUJEC and A. SHUAIB (Saskatoon, Saskatchewan)

Although cardiogenic brain embolism (CBE) is the suspected mechanism of stroke in up to 30% of cases, this can only be confirmed in a minority of patients due to the poor diagnostic yield of transthoracic echocardiography (TTE). This study was undertaken to determine whether transesophageal echocardiography (TEE) provides additional diagnostic information compared with TTE in unselected patients with cerebral ischemic events. Twenty-one consecutive patients (9 male, 12 female, age 61.6 ± 13.6 years [mean = SD]) with either transient ischemic attacks or stroke during the preceding 3 months underwent both TEE and TTE. On the basis of clinical and electrocardiographic findings, two groups were defined: group 1 (n = 9) with clinically suspected CBE (atrial fibrillation 8, mitral stenosis 2, cardioversion 1); group 2 (n = 12) without clinically suspected CBE. Group 1 patients all demonstrated a *possible* cardiac source on TTE (mitral stenosis 3, left atrial enlargement 6, segmental wall motion abnormality 2, mitral annular calcification 1). TEE confirmed these abnormalities and *additionally* demonstrated spontaneous echo contrast in 5 patients and myxomatous mitral valve (MMV) in 1 patient, increasing the likelihood of CBE. In all group 2 patients, TTE was normal. TEE demonstrated a potential cardiac source in 3 patients (MMV 2, patent foramen ovale 1). Thus additional potential cardiac lesions were demonstrated with TEE in 66% of patients with clinically suspected CBE. More importantly a potential cardiac source was demonstrated in 25% of patients *without* clinically suspected CBE or TEE abnormalities.

67.

The Significance of Coronary Artery Disease in Patients with Symptomatic Atherosclerotic Carotid Artery Disease

F.L. SILVER, P. LIU and B. ROSS (Toronto, Ontario)

Mortality following transient cerebral ischemia is primarily due to myocardial infarction (MI), not recurrent stroke.

From February 1988 to December 1989, 79 consecutive patients presenting to the Toronto Hospital with carotid artery ischemia who consented to investigation were found to have at least 35% stenosis of the symptomatic internal carotid artery angiographically. Patients with disabling strokes, recent unstable angina, or recent myocardial infarction were excluded. After clinical assessment, 44 were found to have no evidence of CAD (Group 1), and 35 had a history or ECG suggestive of CAD (Group 2). Dipyridamole thallium scanning was performed in 71 of the patients. Myocardial perfusion defects were detected in 12/39 group 1 patients and 21/32 group 2 patients. In 23/33 patients the perfusion defect was moderate to severe. Although patients thought to be at high risk for MI were excluded, to-date 14 patients have had myocardial events (5 MIs — 3 fatal, 1 sudden death, and 8 episodes of unstable angina). In comparison, 6 patients have had cerebral infarcts (2 fatal, 1 severe) in follow-up. Group 1 patients and their physicians have been blinded from the results so that the prognostic value of thallium scanning can be determined.

The prevalence of clinically important CAD is high in patients with symptomatic carotid artery disease even when it is clinically silent. Thallium scanning may enable physicians to select stroke patients at greatest risk for myocardial ischemia.

68.

Outcome of Asymptomatic Carotid Stenosis

C.Z. ZHU and J.W. NORRIS (Toronto, Ontario)

We have previously reported on clinical outcome in patients with asymptomatic carotid bruits, but potential medical and surgical interventions involve patients with carotid stenosis, not bruits. We evaluated clinical outcome in 693 patients with asymptomatic carotid stenosis divided into three groups: mild (<50%), moderate (50%-75%), and severe (>75%). Mean follow-up 3.5 years.

Annual rate of all ischemic cerebral events (TIAs and stroke) were 1.5% for the <50% group, 5% for those 50%-75%, and 15% in the >75% group. Annual stroke rate was 1.3%. Annual ischemic cardiac events were 3%, 6%, and 8% and annual vascular death rates were 2%, 3% and 6% respectively. Risk factors associated with severity of carotid stenosis were age ($p < 0.008$), male gender ($p < 0.005$) and hypertension ($p < 0.03$).

These data indicate that the major factor determining outcome is severity of carotid stenosis, but only >75%.

Neurosurgery

69.

Antemortem Diagnosis of Gliomatosis Cerebri Using Radiological and Pathological Methods

I.B. ROSS, Y. ROBITAILLE, J.-G. VILLEMURE and D. TAMPIERI (Toronto, Ontario; Montreal, Quebec)

Gliomatosis Cerebri (GC) is characterized by overgrowth of the neuromatrix by neoplastic glial cells with preservation of the general cytoarchitecture. Diagnosis is often made only at necropsy. The purpose of this paper is to present our series of ten cases and to describe the radiological and pathological characteristics that now make antemortem diagnosis possible.

All cases presented to the Montreal Neurological Hospital between 1973 and 1988. The most common symptoms at presentation were: headache (5 patients), seizures (5), motor deficit (5) and memory disturbance (4). Mean survival from onset of symptoms was 19.5 months. Eight cases were necropsy confirmed.

The computerized tomography (CT) picture was usually one of diffuse mass effect and hypodensity with no enhancement. In two of eight cases that underwent CT, however, areas of enhancement were present. One case underwent magnetic resonance imaging. In this instance, T2 weighted images showed contiguous high intensity signal in affected areas. Admixed but generally low intensity signal was seen on the T1 weighted images.

Despite advances in imaging, biopsy remains mandatory for antemortem diagnosis. Five patients underwent biopsy in our series. 80% of these were positive for malignant glial tissue. There was 100% positive yield in the three cases biopsied since the onset of CT scanning. Grading accuracy was good. Diagnosis was aided by immunocytochemistry using glial fibrillary acidic protein and S-100 protein.

GC can therefore be diagnosed before death. Prognosis, however, remains poor. The value of radiotherapy and/or chemotherapy has not been determined. The biology of this rare condition is not fully understood. It seems unlikely that GC arises from a single or small group of malignant stem cells.

70.

Intraoperative Ultrasound and Evoked Potentials for Improved Localization of Small Cerebral Lesions

M. KLINGER, C. STRAUSS, H. ROMSTÖCK and R. FAHLBUSCH (Erlangen, Fed. Rep. Germany)

The removal of small tumors located under the surface of the brain is often difficult if this lesion does not reach the surface or is not detectable by palpation. This is particularly problematic if the lesion is in the vicinity of the motor cortex. Intraoperative ultrasound permits the immediate on line visualization and exact localization of such a lesion during the operative procedure. The probe of the Diasonics Scanner used in our department can be gas sterilized and is applied directly to

the surface of the brain without sterile wrapping. Ultrasound scanning not only indicates the exact direction of the lesion in relationship to the surface of the brain, but also enables electronic measurement of its depth, extent and area. Intraoperative identification of the central sulcus using SEP-phase reversal via median nerve stimulation provides additional safety and was applied in all patients within or close to the motor region. Following removal of the tumor, the tumor bed is scanned to exclude intraoperative hemorrhage.

On the basis of our experience and with the help of these methods, we have been able to remove such lesions with none or minimal defects in 52 cases.

There was no evidence of increased infection following the introduction of these intraoperative diagnostic methods.

71.

Effect of Subcutaneous Implantation on CSF Shunt Anti-Siphon Device Function

M.C. DASILVA, J.M. DRAKE, A. BAHORIC and A. MOCK (Toronto, Ontario)

Anti-siphon devices (ASD) are designed to prevent overdrainage of cerebrospinal fluid (CSF) shunts in the vertical position. Their proper function relies upon the free movement of a flexible membrane in response to external atmospheric pressure. The fibrous capsule that develops around an ASD may interfere with its function.

The flow pressure characteristics of 11 ASDs (8 Heyer-Shulte, 3 PS Medical) were tested at flow rates from 0 to 50 cc/hr and with the distal catheter at heights of 0 to minus 60 cm. Following subcutaneous implantation in piglets, flow pressure measurements were repeated at weekly intervals for 4 weeks.

The effects of subcutaneous implantation were variable. Most ASDs showed an increase in resistance following implantation. This resulted in an average pressure, over all flow rates, as high as 21.5 mm Hg by 4 weeks post implantation (which fell to 3 mm Hg following incision of the capsule). Other ASDs appeared unaffected. Overall there was a 2.8 mm Hg fall in pressure following incision of the capsule for all ASDs (over all flow rates and distal catheter heights).

Histopathology of the capsules demonstrated an outer layer of collagen fibres surrounding an inner layer of abundant histiocytes. Subcutaneous implantation of ASDs has important effects on their performance characteristics.

72.

L'Utilisation du "Injury Severity Score" (ISS) comme Instrument de Prédiction du Résultat d'un Traumatisme Cranio-cérébral

J-L CARON, A. ISMAIL and R.M. FORD (Montréal, Québec)

Le "Injury Severity Score" (ISS) est le résultat d'un calcul de pointage ayant pour but de quantifier la sévérité d'un poly-traumatisme. Le score s'étend sur une échelle de 0 à 75. Ce pointage peut ensuite être utiliser comme instrument de prédiction ou de comparaison entre différents groupes de traumatisés. Le rôle du "ISS" dans l'évaluation d'un traumatisme cranio-cérébral reste toujours à déterminer. L'échelle de Glascow (Glascow Coma Score-GCS) est maintenant standard dans la plupart des centres neuro-chirurgicaux et est appliquée d'une façon semblable au "ISS". Pour déterminer l'utilité d'un tel système en neuro-traumatologie nous avons étudié 71 patients ayant subi un traumatisme carnio-cérébral sans aucune autre blessure et admis à l'Unité de Soins Intensif Neuro-Chirurgicaux de l'Hôpital Général de Montréal sur une période d'un an. L'âge moyen des malades était de 41.6 ans, le "ISS" moyen de 13.2 et le GCS moyen de 12.2 Onze (11) malades sont morts de leur blessures cérébrales donnant une mortalité de 15.5%. Treize (13) malades (18%) furent classifiés comme traumatisme cérébral sévère avec un GCS de 8 ou moins. Le "ISS" moyen de ces maladies etait de 17.9. Neuf (9) d'entre eux sont décédé de leurs trauma cérébral donnant une mortalité de 69%. Dans une étude parallèle, le taux de mortalité chez les traumatisés avec un "ISS" = 20 et n'ayant pas subit de blessure craniocérébrale était inférieur a 10%. Ceci indique que le "ISS" ne peut être utilisé ni pour prédire un résultat ni pour quantifier un état clinique chez les traumatisés sans modifications importantes au pointages attribués aux blessures cérébrales.

73.

Risk Factors for Prediction of Surgical Intracranial Mass Lesions Following Head Injury

M.B. GUTMAN, R.J. MOULTON, G. HOTZ, W.S. TUCKER and P.J. MULLER (Toronto, Ontario)

In order to determine independent predictors of surgical mass lesions in acutely head-injured patients, a retrospective study of head injury patients at St. Michael's Hospital admitted from January 1, 1986 to December 31, 1988 was undertaken. Surgical mass lesions were those cerebral contusions, subdural, extra dural, and intracerebral hematomas producing greater than 5 mm of midline shift on CT scan. Logistic analysis was used to determine whether age, Glasgow Coma Score (GCS), sex, multiple systemic injury, alcohol intoxication, etiology, and pupillary abnormalities were independent predictors of surgical mass lesions.

Complete information regarding the above factors was available in 568 of a total of 575 head injury admissions during the study period. It was found that increasing age ($p < .0000$), decreasing GCS ($p < .0000$), falls ($p < .002$), and pupillary size asymmetry ($p < .05$) were significant predictors of surgical mass lesions. Injury to motor vehicle occupants was a significant predictor of absence of surgical mass lesions compared with other etiologies ($p < .03$). Interestingly, neither bilateral nor unilateral unreactive pupils predicted surgical mass lesions.

The results of this study should contribute to more informed decisions in establishing the priority of diagnostic and therapeutic procedures in trauma management.

74.

Nervous System Injuries in Horse-Riders

M.G. HAMILTON and B.I. TRANMER (Calgary, Alberta)

Horse riding is a popular pastime in Southern Alberta. Serious neurological injury related to this activity has not frequently been appreciated. We present a review of injuries to the nervous system caused by accidents involving horse-riders during a 6 year period.

Records of the three University of Calgary teaching hospitals providing neurosurgical care for Southern Alberta were reviewed if the discharge diagnosis included injury to the nervous system related to horse-riding. One hundred and fifty-five (155) patients suffered neurological injuries related to horse-riding (average age 22 years). One hundred and forty-three (143) patients sustained head injuries. Eleven (11) died and nineteen (19) patients required operation because of their head injury. Nineteen (19) sustained spinal injury of which seven (7) had associated spinal cord or nerve root injury. One (1) patient sustained a peripheral nerve injury. The etiologic, clinical and radiographic characteristics of this patient population will be reviewed.

This review highlights the serious nature and number of nervous system injuries occurring in horse-riders. Efforts must be directed to making horse-riders aware of the possibility of serious neurological injury. Appropriate safety measures, including the need for riders to wear protective head gear, are to be encouraged.

75.

A Ten-Year Experience with Deep-Brain Stimulation for Control of Chronic Pain in Humans

K. KUMAR and R. NATH (Regina, Saskatchewan)

Deep brain stimulation with permanently-implanted electrodes has provided good control of chronic pain syndromes which have been refractory to conventional medical modalities of management. In this series the authors present their experience with 48 patients who have been followed for periods ranging from 6 months to 10 years with successful long-term pain control in 30 patients (63%). Both the periventricular grey (PVG) and specific sensory thalamic nuclei (S-Th) have been used as targets. Our results indicate that there is an initial 2 year fall-off due to idiopathic tolerance, with stable results thereafter, regardless of implant location. This is suggestive of some biochemical or structural modification of tissues around the electrode. Patients with failed back syndrome secondary to multiple disc operations fared well; those with pain secondary to progressive neurological disorders or cancer had only short term pain relief, and those with thalamic pain, cauda equina injury, or phantom limb pain usually had a poor result. Deep brain stimulation (DBS), with proper patient selection, appears to provide long term pain control safely with few side effects or complications.

76.

The Role of Chronic Brain Stimulation (DBS) for Chronic Pain

L.F. PITTY and R.R. TASKER (Toronto, Ontario)

Forty-two patients have been treated with DBS, 2 (follow-up <1 year) too recently to include, using microelectrode recording for physiological localization in most. In 9, DBS hasn't yet been or couldn't be evaluated. As in dorsal cord stimulation, about half the apparently suitable candidates (15) reported significant pain relief, 16 did not, all but 3 failures identified during trial stimulation. Our experience suggests DBS be the first surgical option for central pain of brain origin or for that following complete cord lesions, that it be used after more peripheral surgery fails or proves unfeasible in incomplete cord lesions or deafferentation pain. Lateral [Thalamic(VC), capsular(C), medial lemniscal (ML)] vs. medial(PVG) stimulation was evaluated. In 18 patients tested with both, lateral stimulation proved superior in 17, the exception being a woman with post-stroke pain suffering mainly from allodynia. Lateral thalamic stimulation at VC, IC, or ML was equally effective. Though lateral stimulation initially proved most effective for constant burning-dysesthetic pain, shooting elements and hyperpathia or allodynia might respond. In many, medial or lateral stimulation was not tolerable and this feature will be reviewed. Complications included death from infection under unusual circumstances, a less than 2% overall operative infection rate, 19% of patients suffering transient complications. In 1, a subdural hematoma required evacuation, 11 patients required revisional surgery for repair, electrode migration, or an attempt to achieve electrode positioning.

Epilepsy/Neuropsychology

77.

A Comparison of the Efficacy and Tolerability of Tegretol CR*b.i.d. with Conventional Tegretol Therapy

Z.A. DHALLA (Toronto, Ontario); J. BRUNI; TEGRETOL CR STUDY GROUP

In an open, multicentre, cross-over study of 131 epileptic patients (65 male and 66 female, age 6-65), the efficacy and tolerability of Tegretol CR divitabs b.i.d. was compared with conventional Tegretol therapy. During the eight week study period, each patient was followed for four weeks on conventional Tegretol tablets at the same dose of Carbamazepine that they were receiving prior to entry into the study. After 4 weeks of conventional Tegretol, patients were switched to Tegretol CR b.i.d., at the same total daily dose. After the initial visit, patients were seen every two weeks. At each visit, seizure frequency, adverse effects, footpoint Carbamazepine levels and laboratory tests of hematologic and liver function were recorded.

In terms of efficacy, there was no apparent change in seizure frequency between the two groups. However, because the study was not randomized or blinded, no firm statement can be made regarding the efficacy of Tegretol CR compared to conventional Tegretol. The two groups showed similar trough or footpoint Carbamazepine levels.

With regard to overall tolerability, 44/131 (34%) of patients were felt by investigators to tolerate the CR-preparation better. Some patients noted an improvement in peak-dependent CNS side-effects. Of these symptoms, the most improved included fatigue (18%), double or blurred vision (13%) dizziness (12%) and unsteadiness (11%). At the end of the study, investigators preferred the CR preparation in 76% of the patients, and 70% of the patients preferred taking the CR preparation because of the convenience of b.i.d. dosing and improved tolerability.

*CR = controlled-release

78.

Sixteen Channel Ambulatory Cassette Electroencephalograms

S.S. SESHIA, J. PATRICK and E. SHWEDYK (Winnipeg, Manitoba)

A 16 channel cassette recorder (A1-A2) for taping EEG signals is now commercially available; a maximum of 45 minutes of recording can be done on one side of the tape: (i) the EEG can be sampled automatically for periods of 5-75 seconds, every 5-75 minutes and (ii) a maximum of 4 minutes of EEG signals can be recorded on tape when the event marker button is pressed including two minutes of EEG in random access memory preceding event marker activation.

We have done 18 such recordings on 8 children/adolescents aged 1½-19 years with the objective of getting an electrographic correlate to clinical events. The objective was achieved in 4; recordings failed in 3.

Limitations compared to 4 or 8 channel cassette EEG recorders and telemetry include, (i) weight of 1.6 kg., (ii) the button has to be pressed for the EEG to be recorded during an event, (iii) the onset/offset will not be recorded if they occur more than 2 minutes before/after the button is pressed and (iv) the tape will run out if the button is pressed >11 times.

Technical problems (some of which can be minimized) that affect the recording include, (i) connections loosen, (ii) unexpected battery failure, (iii) sensitivity to static electricity, (iv) boards in the recorder become loose and (v) cross-talk.

Despite the limitations/problems, the A1-A2 recorder can help to (i) differentiate epileptic from non-epileptic events and (ii) provide EEG correlate to seizures, thereby complementing telemetry in a cost-and-time-effective manner.

(Funded by Health & Welfare, Canada; White Cross Guild)

79.

Epilepsia Partialis Continua in Temporal Lobe Epilepsy

H. DESAI and R.S. McLACHLAN (London, Ontario)

Epilepsia partialis continua describes a persistent non-progressive focal motor seizure lasting days or more which is usually related to an acute lesion involving the motor cortex. In contrast, the aura of temporal lobe seizures which can occur alone as a simple partial seizure is a sensory or experiential phenomenon lasting seconds to minutes. We describe three patients with temporal lobe epilepsy in whom the distinction between these two types of ictal phenomena was not so clearly evident. Two female patients and one male age 20, 34, and 42 years, all of

average intelligence, had intractable daily simple partial, daily to weekly complex partial and rare generalized seizures of 15, 25, and 8 years duration, respectively. The simple partial seizures which were also the auras of the other seizures consisted of somatosensory (nose pain), special sensory (foul taste), and autonomic (gassy stomach) symptoms. However, the same symptoms were present continuously at a lower intensity in all three patients for months or years despite the use of numerous anticonvulsants. The patient with the gastric bloating sensation took daily antacids and had a full GI investigation with no cause found. EEG telemetry identified the seizure origins but no changes were seen to account for the continuous symptomatology. Because of the intractable nature of the seizures, temporal lobectomies (two right and one left) were done with gliosis and neuronal loss being found pathologically. All three patients are seizure-free postoperatively (five years, six months, and one year) and the continuous symptoms also disappeared immediately after surgery. We suggest that these patients had a sensory form of epilepsia partialis continua analogous to that described from motor cortex with the only differences being the location of the presumed excessive neuronal discharge in the temporal lobe and the absence of a gross structural lesion.

80.

Idiopathic Seizures in the Elderly

M.B.M. SUNDARAM and M. HISCOCK (Winnipeg, Manitoba; Saskatoon, Saskatchewan)

Incidence of epilepsy in adults increases after the age of 60 (Hauser and Kurland, 67) and no cause is obvious in a third of cases in this age group (Sundaram, 89). We recently studied the seizure patterns and response to anticonvulsants (AC) in 64 patients with idiopathic seizures with onset after age 60. Inclusion criteria were: i) no clinically obvious etiology, ii) normal neurological history, iii) normal CT scan of brain. Mean follow-up from diagnosis was 57 months (range 60 to 110 months).

Clinical features suggested following seizure types: generalized tonic clonic — 43 cases, complex partial — 20, and simple partial — 1 patient. Seizures in 30 of 43 cases with generalized tonic clonic attacks were nocturnal.

Anticonvulsants (AC) were used in 49 patients and most of them (n.46) received single drug. Adverse reaction occurred rarely (skin rash — 1, drowsiness — 1). Thirty-four of forty-nine cases on AC had no further seizures. Twelve other patients had only one or less seizure per year. Three had 2 to 6 attacks per year but compliance was poor in all of them. None of the 15 patients who were not given AC had any further recurrence.

Thirty-eight patients were seen after seizure and 16 of them received AC. Seizure recurred in 3 of these 16 cases on AC and in 9 of 22, who were not on AC ($p > 0.25$).

Findings suggest benign course and excellent response to AC in patients with idiopathic seizures starting after the age of 60. Generalized tonic-clonic seizure — in particular nocturnal — is the most common seizure type among these patients.

81.

Differences in Lesion Size May Explain Laterality Differences in Unilateral Neglect After Hemispheric Brain Injury

S. IRVING, R.J. RIOPELLE, J. INGLIS and M. DONALD (Kingston, Ontario)

Unilateral neglect is commonly considered to be more severe after right, as compared to left, brain injury in human subjects. Current hypotheses advanced to explain this laterality difference (e.g., Heilman, Bowers, Valenstein and Watson, 1987; Mesulam, 1985) propose that mechanisms for attention to contralateral space are differently represented in the two cerebral hemispheres. Fifty-four patients were assessed on tests of unilateral neglect in both the visual and the tactile modalities, and also for the presence of extinction on double simultaneous stimulation in the visual, tactile and auditory modalities. These patients were considered to be a random sample of unilaterally brain-injured (52 stroke, 2 tumour cases) patients. The performance of subjects (Ss) with right lesions was consistently poorer than that of those with left lesions, because of the inferior performance of the right male Ss. Volumetric estimates of the brain lesions were made for the 35 Ss for whom positive CT scans were available. The mean estimates for the different patient groups were as follows: males with right lesions 946.4; left lesions males 748.3; right lesions females 212.2; left lesions females 333.8 cubit units. Examination of these scores revealed that the right lesion men with large lesions (>1000 units) did more poorly on almost all of the tasks than right men with smaller lesions (<1000 units). These data suggest that, in at least some studies, the laterality differences observed after hemispheric lesions may be due, not primarily to hemispheric differences in brain mechanisms for attention, but to lateralized differences in the size of brain lesions, notably larger lesions found in the right male Ss. It is thus suggested that assessment of lesion volume should be routinely included in future investigations of unilateral neglect.

82.

Neuropsychological Abilities and Genetic Testing in Presymptomatic Huntington Disease

G.W. JASON, E.M. PAJURKOVA, O. SUCHOWERSKY and D.I. HOAR (Calgary, Alberta)

Neuropsychological evaluations were conducted on 27 individuals who were at risk for Huntington disease, but who had no signs or symptoms of the disease. Molecular genetic analysis using linked DNA probes demonstrated that 14 people had a high probability (greater than 90%: HD+ group) and 13 had a low probability (less than 10%: HD– group) of having inherited the abnormal gene. Subjects in the HD+ group performed significantly worse than those in the HD– group on the Wisconsin Card Sorting Test, confirming previous findings. Results support the view that some individuals may show neuropsychological abnormalities before development of overt signs and symptoms of Huntington disease.

Impairment on the Wisconsin Card Sorting Test has been associated with frontal-lobe dysfunction. In addition, other studies have shown that some HD+ individuals have impaired caudate glucose metabolism. Results therefore also support the view that the caudate nucleus plays a role in cognition, and that its cognitive functions are related to those of the frontal lobes.

83.

Depressive Symptoms in Parkinson's Disease: A Comparison with Disabled Control Subjects

T.S. EHMANN, R.J. BENINGER, M.J. GAWEL and R.J. RIOPELLE (Vancouver, British Columbia; Kingston; Toronto, Ontario)

A high incidence of depressive symptoms has been observed in patients with Parkinson's disease (PD). PD involves a loss of central monoamines and a decrease of monoamines has been implicated in depression; therefore, it is possible that depressive symptoms in PD result from the loss of endogenous neurotransmitters. However, it is equally possible that depressive symptoms represent a reaction to the chronic disabling course of PD. By comparing depressive symptoms in PD patients to those in matched patients with other chronic disabling diseases not involving a loss of central monoamines, it may be possible to decide between these alternatives. Thus, depressive symptoms were assessed in 45 patients with PD and 24 disabled controls that did not differ from the PD subjects on a measure of functional disability. Results showed that PD subjects obtained significantly higher total

scores on the Beck Depression Inventory (BDI). PD subjects scored significantly higher than controls on BDI items grouped to reflect cognitive-affective and somatic depressive symptoms. The BDI scores of PD subjects were not reliably related to age, sex, duration of PD, or clinical ratings of PD symptom severity or functional disability. Self-rated disability and the number of recent medical problems were the greatest *predictors of depressive symptoms. These findings supported the* hypothesis that depressive symptoms in PD may not represent solely a reaction to disability.

84.

Prevalence and Correlates of Emotional Disturbance Among Multiple Sclerosis (MS) Patients in Remission

S.A. WARREN and K.G. WARREN (Edmonton, Alberta)

Researchers have examined the prevalence and correlates of emotional disturbance among MS patients. However reports have rarely distinguished between patients in exacerbation versus remission at the time of interview, even though exacerbations seem to have a significant impact on sense of well-being.

Ninety relapsing-remitting patients who had a regular checkup at a Canadian MS clinic over a two-year period, and had been in remission for at least 6 months, were measured on emotional disturbance using the General Health Questionnaire (GHQ-28). Data was also collected on: age, gender, duration of illness, relapse rate, most common relapse symptom, and disability status. Frequency and perceived intensity of recent stressful life events were measured using the Daily Hassles Scale; and coping techniques were measured by the Ways of Coping Checklist. Patients specified their most stressful recent event.

Thirty percent of MS patients exhibited emotional disturbance according to the GHQ, somewhat higher than reported community rates which range from 16 to 22%. More emotionally disturbed than non-disturbed patients scored above the whole group mean on frequency ($X^2 = 6.9$, $p < .01$) and on intensity ($X^2 = 11.2$, $p < .01$) of daily hassles. However the mean frequency (22) and intensity (1.3) of hassles reported by MS patients did not differ from community norms reported by the scale's author (22 and 1.5). Only a minority of patients in both the disturbed and non-disturbed groups described a specifically MS-related situation as their most stressful recent event (10 and 3% respectively).

Case-control studies comparing MS patients in remission to members of the general population might clarify whether there are any differences between them on prevalence or correlates of emotional disturbance.

Neuro-Ophthalmology/Evoked Potentials

85.

Compensatory Eye Acceleration During Vestibular Stimulation in Internuclear Ophthalmoplegia

J.L. JOHNSTON, J.A. SHARPE (Winnipeg, Manitoba; Toronto, Ontario)

We investigated the vestibulo-ocular reflex using transient vestibular stimuli in 6 patients with internuclear ophthalmoplegia (INO). Trials were conducted in the dark (VOR) and with a head-fixed target (VOR cancellation). Initial VOR gain in the first 40 msec after head motion was significantly reduced relative to normal for both VOR and cancellation paradigms. Compensatory eye acceleration saturated at 175-200 deg/sec/sec, which occurred at a peak head acceleration of 400 deg/sec/sec. When the head decelerated to 0 (peak head velocity), eye acceleration and velocity became normal.

The onset of VOR cancellation was significantly prolonged for adduction and cancellation was subnormal. On abduction, VOR cancellation was normal.

In patients with INO, low initial VOR gains and eye acceleration saturation may reflect damage to the direct 3-neuron VOR pathway. The partly damaged medial longitudinal fasiculus (MLF) or extra-MLF pathways can still initiate the VOR, albeit at a much lower gain. On adduction, the output of the cancellation system is likely impaired, although damage to smooth pursuit and non-visual (head acceleration) inputs may contribute to the cancellation defect.

86.

Vertical Vestibulo-Ocular Reflex, Smooth Pursuit, and Eye-Head Tracking After Midbrain Lesions

J.A. SHARPE and P.J. RANALLI (Toronto, Ontario)

Vertical smooth eye movements were investigated in 14 patients with midbrain lesions (7 infarcts, 4 hematomas, 2 tumors) using a magnetic search coil technique. CT and MRI demonstrated unilateral lesions in 10 patients and bilateral lesions in 4. All had vertical saccade palsy, upward, or downward and upward. When compared with 14 age-matched control subjects, many patients demonstrated reduced smooth pursuit gain, up and down. Vertical vestibulo-ocular reflex (VOR) gain was reduced during active vertical head shaking in darkness at frequencies from 0.25 to 2.0 hertz. Visual enhancement of the VOR by fixating a stationary target was subnormal upward and downward. Cancellation of the vertical VOR was defective in both vertical directions during head free tracking; however, vertical eye-head tracking gain was normal since patients increased the amplitude of their head motion to compensate for the uncancelled VOR. The vertical VOR showed abnormal phase lead of the eyes before the head during head shaking in darkness, indicating that midbrain damage impaired the integration of eye velocity commands. Apart from the phase lead, the effects of midbrain lesions were qualitatively similar to those of lesions of the medial longitudinal fasciculus, which in our earlier study (Brain 1988; 111: 1299-1317) caused VOR phase lag, attributed to disruption of ascending eye velocity signals and relative preservation of eye position signals. We suggest that caudal tegmental lesions affecting the MLF disrupt the direct VOR pathway, leaving the indirect pathway relatively preserved, whereas rostral midbrain lesions damage the indirect VOR pathway, and the neural integration of vertical eye velocity commands.

87.

Motion Blindness and Insensitivity in Multiple Sclerosis

D. REGAN, J.A. SHARPE and A.C. KOTHE (Toronto, Ontario)

We developed a procedure to measure the ability of the visual pathway to extract shape from motion. This test requires a patient to read motion-defined (MD) letters. These letters differ physically from the usual contrast-defined (CD) letters that are dimmer or brighter than their surroundings in that the boundaries of MD letters are made visible exclusively by a step in velocity while the boundaries of CD letters are made visible by a step in luminance. Patients viewed a random pattern of bright dots containing a perfectly camouflaged letter. The letter was made visible by moving dots within the letter and of the background at equal speeds in opposite directions. Results for 50 eyes of 25 patients with multiple sclerosis were compared with 50 normal eyes. When tested with large (50 min arc, i.e., 6/60) MD letters, 34/50 eyes of patients required abnormally high dot speeds to read letters; 5 eyes were effectively motion blind in the sense that they could not read large letters even at our highest speed difference of 0.45 deg/sec. The normal limit was 2.5 SD from the control mean and there was 1/50 false positive. Of the 34/50 eyes, 23 had normal Snellen acuities.

We conclude that MD test letters can detect demyelination that is not picked up with CD test letters of high, intermediate, or low contrast. We suggest that the MD letter test can detect dysfunction in the human equivalent of a pathway in monkey brain that originates in large retinal ganglion cells, passes through the magnocellular layers or the lateral geniculate body, includes cortical area MT, and is involved in processing motion.

88.

Management of the Cavernous Sinus Syndrome

W.A. FLETCHER, L.M. METZ, M.E. MACRAE and T.P. SELAND (Calgary, Alberta)

Orbito-frontal pain with various combinations of ipsilateral ocular motor, trigeminal and oculosympathetic palsies signifies a lesion of the cavernous sinus. Diagnosis may require biopsy if CT or MR scans show a mass lesion. If investigations are negative and ophthalmoplegia remits spontaneously or with prednisone therapy, biopsy may be avoided and often a tentative diagnosis of idiopathic inflammation of the cavernous sinus, i.e., Tolosa-Hunt syndrome, is considered. However, clinical experience prior to the advent of CT showed that occult parasellar tumours could mimic Tolosa-Hunt syndrome. High-resolution CT and MR now allow exquisite definition of cavernous sinus detail but whether these techniques reliably separate neoplasms from Tolosa-Hunt syndrome is debatable.

Three unusual cavernous sinus lesions will be presented: plasmacytoma, multiple myeloma, and an undiagnosed enhancing lesion. These cases will show that high-quality advanced imaging is still fallible in distinguishing neoplasms from Tolosa-Hunt syndrome and that a trial of prednisone may avert biopsy even when CT shows an enhancing cavernous sinus lesion.

89.

Visual Evoked Potential Current Source Localization in Ocular and Oculocutaneous Albinism

S.G. COUPLAND and C.M.B. SKOV (Calgary, Alberta)

Evidence of visual pathway misrouting in human albinism has been established both neuropathologically as well as electrophysiologically through measurement of the Visual Evoked Potential (VEP). Interhemispheric VEP amplitude asymmetry with monocular stimulation has been reported as evidence of aberrant retinogeniculocortical projections. Greater VEP amplitude is seen over the occipital region contralateral to the stimulated eye. Previous studies utilizing VEP asymmetry have typically used linked ear or frontal reference sites. These reference sites are not entirely inactive during VEP recording. Source derivation is a "reference-free" system of recording evoked potentials which will accentuate the contribution of the potential field at the active electrode.

Ten patients clinically diagnosed as having ocular or oculocutaneous albinism were examined. Monocular VEPs were recorded using 5 or 7 channel transverse array of electrodes over both occipital regions with standard monopolar referential recordings to linked ears. Bipolar and source derivations were computed by repeated application of the difference operator. A comparison of amplitude asymmetry and current source and sink localization revealed generally good correspondence between the two measures. Overall, amplitude ratios were found to be more sensitive and reliable than current source-sink analysis in the detection of visual pathway misrouting.

90.

Evoked Potential Correlates of Cerebral Malformations

S.G. COUPLAND and H.B. SARNAT (Calgary, Alberta)

Cerebral malformations are developmental disorders of morphogenesis of the fetal brain resulting from faulty genetic programming or insults that interfere with maturational processes. To date there are no systematic studies of the evoked potential correlates in these conditions. A total of 109 sensory evoked potential (20 electroretinogram [ERG], 61 visual evoked potential [VEP] and 28 auditory brainstem response [ABR]) studies were performed in 27 children with defined cerebral malformations. Diagnoses were confirmed by CT scan, supplemented by MRI, cranial ultrasound, or neuropathological examination.

Sensory evoked potential studies were abnormal in over half of patients studied, but the VEP was unable to identify or distinguish specific supratentorial cerebral malformations. ABR abnormalities were documented in cases of holoprosencephaly, lissencephaly, pachygyria and generalized megalencephaly. ABR abnormalities were not observed in septo-optic dysplasia or focal dysplasia of the cerebral cortex. We conclude that evoked potentials are not a diagnostic criterion of severe dysplasias, but rather serve as a supplementary tool for detecting variable associated abnormalities of brain development that may affect visual and central auditory pathways or their cerebral cortical or brainstem targets.

91.

Brain Stem Cavernous Angioma — Pseudotumor: M.R. Contribution

M. PREUL, J. ESPINOSA, R. LEBLANC and J.-G. VILLEMURE (Montreal, Quebec)

From 1987 to 1988, six patients were referred to our institution and diagnosed using magnetic resonance imaging (MRI) as having a brainstem cavernous angioma. These had been previously diagnosed using computerized tomography (CT) and angiography as space occupying lesions consistent with intra-axial tumors.

Three of the patients were male and age ranged from 31 to 62 years. Lesion location extended from pons to the posterior third ventricle; the diagnoses included glioma (4), pinealoma (1), third ventricle tumor/aneurysm (1). Three had undergone external beam radiation to their lesions. Most patients had fluctuating clinical courses complicated by sudden deterioration; one was admitted in coma. Clinical signs and symptoms included ataxia, spasticity, hemiparesis, tremor, dysarthria, decreased sensation and gaze problems.

The un-enhanced CT scan depicted an ill-defined hyperdense lesion in 5 of the 6 cases. Contrast enhancement (faint) was identified in 4 of the 6 cases. Angiography (including delayed venous phase imaging and subtraction) was performed in 4 cases: three showed a mass lesion with adjacent vessel displacement, one showed subtle venous pooling.

MRI (1.5 Tesla) depicted the lesions clearly in all cases. T^2 imaging showed a discrete lesion with a mixed high intensity, reticulated central core surrounded by a low intensity rim. Volume ranged from 1.2 cm^3 to 24 cm^3. Feeding vessels or draining veins could not be identified.

All patients with brainstem space-occupying lesions consistent with intra-axial tumors should undergo MRI, which has proven useful in identification of more benign lesions such as cavernous angiomas. The management of these patients may thus be improved.

92.

Hearing Conservation in Acoustic Neuroma Surgery: A Current Appraisal

D.W. ROWED, J.M. NEDZELSKI and M.Z. CASHMAN (Toronto, Ontario)

Complete excision of acoustic neuromas with conservation of serviceable hearing is achieved in only a minority of cases. Best results are in patients with small tumours and good preoperative hearing. Intraoperative monitoring of auditory function may contribute to a successful outcome.

The current Sunnybrook series of acoustic neuroma excisions numbers 331 patients; 281 by a translabyrinthine approach and 50 by a suboccipital hearing conservation approach. Thirty of these 50 cases had intraoperative cochlear nerve monitoring.

All hearing conservation cases have had pre and postoperative pure tone and speech audiometry, with a mean interval of 1.3 months. Serviceable hearing is defined by a speech reception threshold (SRT) ≤50 dB and speech discrimination score (SDS) of ≥60 dB (50/60 rule).

Twenty-two patients had detectable postoperative hearing (44%), 16 had serviceable hearing (32%), and 28 did not have detectable hearing

(56%). The incidence of immediate, complete facial paralysis is 14.6% for tumors ≤1.5 cm operated by the suboccipital approach compared with 6.1% for similar tumours operated by a translabyrinthine approach. This difference is not statistically significant (p = 0.13).

Mortality was 3/331 (0.9%) and the incidence of facial nerve discontinuity was 21/331 (6.3%). Approximately 1/3 of selected patients with small (≤1.5 cm) tumours and serviceable preoperative hearing retained unchanged postoperative hearing as shown above. If one considers the entire series, <7% had detectable postoperative hearing, and <5% had serviceable hearing.

The role of intraoperative cochlear nerve monitoring and the future of hearing conservation will be discussed.

FRIDAY, JUNE 29, 1990 - P.M.

Epilepsy

93.

Barbiturates Suppress Epileptiform Bursts in Hippocampal Slice by Blocking Spontaneous EEG-Like Rhythms Which Trigger the Bursts

J.H. SCHNEIDERMAN (Toronto, Ontario)

Guinea pig hippocampal slices perfused with 3.4 mM penicillin produce spontaneous, synchronized bursts. Phenobarbital (20-400 μm) and pentobarbital (10-100 μm) increase burst interval and threshold, but, have relatively little effect on the burst amplitude. The bursts appear to be triggered by excitatory synchronous synaptic potentials (SSPs) which can be dissociated from the bursts by perfusing the slices with low concentrations by penicillin. Slices perfused with 0.34 mM penicillin produce oscillating spontaneous field potentials (SFPs) corresponding to synaptic potentials which resemble EEG rhythms *in vivo*. Power spectral analysis was used to examine the effects of the drugs on the SFPs. The barbiturates reduced the magnitude, but, not the frequency of these SFPs at concentrations corresponding to those which suppressed bursts. Studies on evoked potentials suggest that the drugs suppressed the SFPs by selectively enhancing inhibitory mechanisms not by blocking EPSPs. The barbiturates appear to suppress bursting by enhancing recurrent inhibition thus preventing the synchronization of recurrent EPSPs required to trigger the bursts.

94.

How Large are Epileptogenic Zones in Partial Epilepsy?

A. PALMINI, L.F. QUESNEY, P. GLOOR, A. OLIVIER and F. ANDERMANN (Montreal, Quebec)

The anatomical extension of the epileptogenic zone was studied in 18 patients with medically refractory complex partial seizures, who required intensive EEG monitoring with unilaterally implanted intracranial electrodes after failure of extracranial EEG monitoring to localize the epileptic focus.

The brain region containing most of the interictal spiking defined by phase reversals and or equipotentiality of the abnormal potentials, was defined as the main epileptogenic zone (MEZ) and identified in each patient.

The extracranial interictal EEG findings were correlated with the localization of seizure onset provided by intracranial EEG recordings.

RESULTS: 1. The anatomical extension of the MEZ followed a continuum, ranging from focal to regional, lobar, multilobar or hemispheric distribution. **2.** In only 3/18 patients, were seizures with focal onset recorded with intracranial electrodes. In 15/18 patients the seizure onset was wider: regional, lobar or multilobar. **3.** Interictal surface epileptic abnormalities (MEZ) restricted to a single lobe were reliable predictors of regional seizure onset determined by intracranial recordings.

95.

Seizure Outcome Following Temporal Lobectomy in Patients Over Age 45 Years

C. CHOVAZ, R.S. McLACHLAN, W.T. BLUME and J. GIRVIN (London, Ontario)

Temporal lobectomy is an effective treatment for temporal lobe seizures which are intractable to anticonvulsant therapy. Most patients who undergo this surgery are young adults and it has been suggested that the prognosis of the procedure is age-dependent with older patients having a less favorable outcome. We present the results of temporal lobectomy (10 right and 10 left) in 20 patients operated on under neuroleptanalgesia for intractable epilepsy between the ages of 45 and 60 years (mean 51 years) with at least a 1.5 year (mean 4 years) follow-up. Seizure duration was 2 to 43 years (mean 23 years). Preoperative assessment included EEG telemetry, MRI or CT scan and neuropsychological testing. Seizures were recorded in 19 patients. Strictly unilateral ictal and interictal EEG abnormalities were found in 9 of the 20 patients. One patient had normal pathology, 3 had low grade gliomas, one an AVM, and 15 had neuronal changes and gliosis. Two in the latter group (ages 49 and 59) were also diagnosed pathologically as Alzheimer's disease although they continue to show no signs of dementia 2 and 2.5 years after surgery. Seizure outcome is considered excellent in 70% (6 were seizure-free and 8 had more than 90% reduction in seizures), good in 15% (50-90% seizure reduction in 3 patients) and poor in 15% (less than 50% seizure reduction in 3 patients). The only unexpected complication was a mild persisting hemiparesis in one patient. In most older adults the prognosis following a temporal lobectomy is good. The response to surgery, the EEG data and the pathology do not provide strong support for the concept that uncontrolled focal epilepsy is a progressive disease.

96.

Outcome of Temporal Lobectomy in Children With Symptomatic Location-Related Epilepsy

H. OTSUBO, H.J. HOFFMAN, P.A. HWANG, J.M. DRAKE, L.E. BECKER and S.H. CHUANG (Toronto, Ontario)

Between 1974 and 1989, 68 children aged 7 months to 18 years (mean 13 years) underwent temporal lobectomy for epilepsy. Sixty-five (96%) had complex partial seizures and 36 (53%) had generalized tonic-clonic seizures. The duration of seizures ranged from 3 months to 18 years (mean 7 years). Epileptiform foci were localized to the temporal lobe in 66 (97%) in scalp EEG, and in the inferomedial region in 13 of 24 (54%) with sphenoidal electrodes. CT scan disclosed lesions in 36 of 53 (68%), and MRI in 14 of 17 (82%), including mesial temporal sclerosis 6. ^{99}HmPAO SPECT scans displayed abnormality in 12 of 16 (75%). Pathological diagnosis included 24 neoplasms (10 gangliogliomas, 5 astrocytomas, 4 oligodendrogliomas, 4 mixed tumors, and 1 meningioma), 5 venous malformations; mesial temporal sclerosis was present in 20 cases, 9 with ipsilateral mass lesions. ECoG was performed in all cases with depth electrodes showing epileptiform activity in the hippocampus in 12 of 16 patients. Follow-up period ranged from 6 months to 14 years (mean 34 months). Thirty-four patients (50%) were seizure-free; 8 (24%) off medication, 21 (31%) had >50% reduction in seizures; worthwhile improvement 55 (81%). Behavioural problems improved 17 of 33 cases. There were no deaths. Twenty-two had postoperative quadrantanopsia. Surgical complications included dysarthria (1), facial weakness (2) and hemiparesis (3), comprising Rasmussen syndrome and recurrent tumors. There was significant correlation between the duration of seizures and the outcome, with the patients having seizures for less than 6 years having the best results. Temporal lobectomy should be considered in children whose seizures are intractable to medical therapy, particularly in cases of occult vascular malformation and long standing benign tumors.

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97.

Surgical Treatment of Epilepsy Associated With Schizencephaly

R. LEBLANC, D. TAMPIERI, Y. ROBITAILLE, W. FEINDEL, A. OLIVIER and F. ANDERMANN (Montreal, Quebec)

Schizencephaly is a developmental disorder characterized by the presence of unilateral or bilaterally symmetrical clefts extending from the pia-arachnoid to the ventricle or peri-ventricular germinal area. The more extreme manifestations usually result in death in infancy while lesser forms are associated with mental retardation, hemiparesis, and epilepsy. With the advent of magnetic resonance imaging (MRI) of large epileptic populations there has been an increased recognition of this condition. We report our experience with the assessment and treatment of 3 patients with schizencephaly and medically intractable seizures. The 3 males were aged 24 to 37 years. Two had delayed developmental milestones and hemiparesis or hemiplegia. One had a normal development and normal neurological examination. Seizures had begun between the ages of 15-19 years; and the patients had been epileptic for 5-22 years before surgery. All had partial simple or generalized seizures with predominant electroencephalographic (EEG) and electrocorticographic epileptic activity localized to a temporal and/or frontal lobe. Pre-operative neuropsychological assessment indicated widespread dysfunction maximal at the areas of predominant EEG abnormality. MRI demonstrate anterior parasagittal and posterior Sylvian cerebral clefts with ventricular diverticuli, grey matter heterotopia, polymicrogyria and agenesis of the corpus callosum. The patients underwent temporal and fronto-temporal (2 patients) lobectomies without resultant neurological deficits or neuropsychological deterioration. Post-operative follow-up of 1-2 years shows marked reduction in seizure frequency. Surgery is well tolerated in patients with this condition and seizures can be markedly alleviated by resection of epileptogenic areas. Definite conclusions await longer follow-up and greater surgical experience.

98.

Hemispherectomy and the Insula

C. MASCOTT, J.-G. VILLEMURE, F. ANDERMANN and T. RASMUSSEN (Montreal, Quebec)

The role of the insula in seizure disorders has not always been easy to define. We have examined the Montreal Neurological Hospital series of 55 consecutive hemispherectomies (1952-1988) with regard to removal or preservation of insular cortex and overall outcome. In 27 of these patients the insular cortex was removed, in 28 it was preserved.

In the group where the insula was removed, 24% of patients remained seizure-free and a total of 80% experienced less than 2 seizures per year post-operatively. In the group where insular cortex was preserved, 74% remained seizure-free and 88.8% had less than 2 seizures a year post-operatively. These results and other variables affecting outcome after hemispherectomy are discussed.

We conclude that preservation of insular cortex does not seem to adversely affect outcome with regard to seizure control in our series of hemispherectomies. We empirically perform removal of insular cortex only if epileptiform insular activity is found intra-operatively.

99.

Functional Hemispherectomy in Children

J.-G. VILLEMURE, F. ANDERMANN and T. RASMUSSEN (Montreal, Quebec)

Fifteen children under the age of 16, suffering from intractable epilepsy underwent functional hemispherectomy. The age range was from 16 months to 15 years (median 5 years). All patients had developed a maximal hemiplegia or a progressive moderate to severe hemiparesis. Most patients had an hemianopsia. The etiological factors responsible for the neurological deficit and seizure disorder were chronic encephalitis (7 patients), brain dysplasia (1 patient), Sturge-Weber angiomatosis (3 patients), trauma (3 patients) and infantile hemiplegia (1 patient). There were 6 males and 9 females. There were 8 right and 7 left functional hemispherectomy. Complications were as follows: 1 death from non-neurological cause, 1 brain abscess treated with antibiotics, 1 hydrocephalus which occurred 3 years post-operatively, treated with CSF shunt. Of the surviving patients, 12 patients are seizure-free (85.7%). Two patients continue to have seizures, but the frequency of the attacks has been reduced by more than 80%.

Hemispherectomy remains an excellent treatment modality for patients presenting medically refractory seizures associated with unilateral motor deficit. When hemispherectomy is indicated, we believe that functional hemispherectomy is the procedure of choice.

Neurobiology

100.

Mechanism of Spread of Reactive Astrocytosis in Surgically Injured Rodent Brain: Migration vs. Soluble Factors?

R.M. MOUMDJIAN, J.P. ANTEL and V.W. YONG (Montreal, Quebec)

Previous studies have demonstrated that although reactive gliosis is most intense close to the site of cerebral injury, reactivity also occurs in remote areas either ipsilateral or contralateral to the lesion site. The mechanism of contralateral gliosis is poorly understood. Smith et al have shown astrocyte migration onto corpus callosum millipore implants in fetal and newborn mice. We undertook the present experiments to address whether contralateral gliosis in adult rats was due to the migration of astrocytes from the lesion site, or whether the release and diffusion of soluble factors gave rise to contralateral gliosis.

Rats (one month old) were subjected to either callostomy alone, left cortical stab wound alone, callosotomy and left cortical stab wound or no surgery; 7 days later, animals were sacrificed. Formalin-fixed, paraffin-embedded sections were obtained and immunostained for GFAP, an astrocytic intermediate filament that becomes readily detectable in reactive astrocytes. While untreated controls showed no cortical gliosis, callosotomy alone induced *moderate* bilateral cortical gliosis; in both callosotomized and non-callosotomized rats, a left cortical stab wound produced *marked* bilateral cortical gliosis. In all lesion models, both the intensity of GFAP staining and the number of reactive astrocytes were most marked in cortical areas abutting the subarachnoid spaces and decreased gradually in the deeper cortical layers.

Our results suggest that the mechanism of contralateral and diffuse gliosis is due to a diffusable substance(s) that induce(s) the gliosis rather than migration of ipsilateral astrocytes through the corpus callosum to the contralateral hemisphere. Candidate molecules mediating the effect include cytokines released by lymphoid or glial cells present at the lesion site.

101.

T-Cell Receptor Repertoire in Experimental Allergic Encephalomyelitis and Multiple Sclerosis. Studies on Repertoire Restriction and Implications for Therapy

R.B. BELL, J. OKSENBERG, S. STUART, A.B. BEGOVICH, H. ERLICH, L. STEINMAN and C. BERNARD (Stanford, U.S.A.)

The identification of activated T-cells in the brain, spinal cord and cerebrospinal fluid of individuals with multiple sclerosis (MS) and in animals with experimental allergic encephalomyelitis (EAE) suggests that these cells are critical in the pathogenesis of autoimmune demyelinating disease. Utilizing the polymerase chain reaction to specifically amplify T-cell receptor variable region sequences from transcripts derived directly from central nervous system tissue we have defined a restriction in T-cell receptor usage which potentially may serve as a target for specific immunotherapy.

102.

Modulation of Major Histocompatibility Complex Class II Antigens on Human Myoblasts After Treatment with Gamma-Interferon

R. MANTEGAZZA, S.H. HUGHES, H.M. BLAU, R.B. BELL, J. OKSENBERG and L. STEINMAN (Stanford, U.S.A.)

Duchenne muscular dystrophy (DMD) and its animal model, the mdx mouse, are characterized by absence of dystrophin in muscle. Fusion between host myofibers and donor muscle precursor cells has been shown to occur spontaneously. Transplantation of myoblasts from normal mice to immunodeficient nude/mdx mice allowed for conversion of muscle fibers from dystrophin negative to dystrophin positive. Successful grafting is conditioned by the severity of the rejection reaction and particularly by the expression of major histocompatibility complex (MHC) class II antigens on the surface of myoblasts. Different populations of human myoblasts were cloned by flow cytometry and treated with recombinant human gamma-interferon (gamma-IFN). Expression of all class II antigens (DR, DQ and DP) was determined by flow cytometry and staining with anti-HLA class II monoclonal antibodies, and by RNA-polymerase chain reaction (PCR) analysis. MHC class II antigens appeared to be differentially modulated at the surface of myoblasts and their induction due to a de novo protein synthesis, as demonstrated by the PCR analysis. The extent of the expression of MHC class II molecules on human myoblasts would make the transplant reaction likely and indicates that immunosuppression may be necessary for myoblast transplants in dystrophic patients.

103.

Human Immunodeficiency Virus Replicates in Primary Human Fetal Brain Cells

A. NATH, K. AMEMIYA and E.O. MAJOR (Bethesda, U.S.A.)

AIDS dementia complex is an early and frequent manifestation of human immunodeficiency virus (HIV) infection, but its pathogenesis remains unknown. To determine if HIV can replicate in brain derived cells, dissociated cultures from human fetal brain (8-14 weeks gestation) and separated astrocyte cultures were established and infected with a HIV strain (NL4-3) or transfected with HIV provirus (pNL4-3). Rising titers for p24 antigen in culture supernatants were seen in the first 2-5 days after infection and as early as 4-8 hours following transfection. Small amounts of p24 were present for at least 6-7 weeks after *transfection of astrocytes. No cytopathic or morphological changes* were noted in these cultures. Infectious virions were present in all cultures after transfection as determined by co-cultivation with a CD4+ cell line (A3.01) but could not be determined in the cell free supernatants 3-4 weeks after transfection. Cell to cell contact was necessary for detecting infectious virions in long term cultures. Chloramphenicol acetyl transferase (CAT) assay was used to determine the transcriptional efficiency of the HIV regulatory sequences in the astrocytes. The cells were co-transfected with pNL4-3 and a plasmid pBenn CAT in which the HIV long terminal repeat was linked to the CAT gene. CAT activity paralleled the increase in p24 antigen following transfection. These results suggest that HIV is a neurotropic virus. It can transcribe, replicate and produce infectious virions in astrocytes. It establishes a low level persistent infection in long term fetal astrocyte cultures.

104.

The Serotonin Synthesis Rate Measured in Dog Brain by PET

M. DIKSIC, S. NAGAHIRO, T. CHALY, T.L. SOURKES, Y.L. YAMAMOTO and W. FIENDEL (Montreal, Quebec)

The neurotransmitter serotonin (5HT) is widely distributed in the brain and has been postulated to be involved in many brain functions (e.g. pleasure, control of eating) and brain disorders (e.g. depression, epilepsy). Several methods have been proposed for the measurement of the brain serotonin synthesis rate but all require prior pharmacological treatment and/or time-consuming chemical separation of different metabolites. In addition, all these methods are terminal for the animal and as such are not applicable for repeated measurement in the same brain, nor for humans.

We now report a procedure, based on our autoradiographic method established in the rat brain which, for the first time, permits repeated measurements in the same brain, does not require any pharmacological treatment and can be easily applied to humans. We have evaluated the influence of the changes in the plasma tryptophan concentration and the PaO_2 on the rate of serotonin synthesis in dog brain. The increase of PaO_2 from 76 ± 2 to 106 ± 1 mmHg resulted in an increase in the brain synthesis rate from 39 ± 8 to 54 ± 10 pmol g^{-1} min^{-1}. (The plasma tryptophan concentration in this dog was 75 nmol/ml.) The increase in the plasma tryptophan concentration from 16.6 (PaO_2; 90 ± 2 mmHg) to 191.5 (PaO_2; 90 ± 2 mmHg) and then to 381 (PaO_2; 91 ± 2 mmHg) nmol/ml resulted in an increase of the synthesis rate from 18.5 ± 4.5 to 320 ± 95 and then to 620 ± 112 pmol g^{-1} min^{-1}. We also estimated the K_m(app) and V_{max} for tryptophan transport through the blood-brain barrier (BBB) to be 303 ± 54μM and 63 ± 10 nmol g^{-1} min^{-1}, respectively. Since no other measurements of the rate have been reported for the dog brain, this synthesis rate can only be compared to those for the rat and mouse brain. Synthesis rates between 16.7 and 41.7, and 27.5 and 144.8 pmol g^{-1} min^{-1} have been reported in the rat and mouse brain, respectively. The K_m(app) and V_{max} for tryptophan transport through the blood-brain barrier are in good agreement with measurements in adult rat and newborn rabbit.

(Supported by the MRC of Canada SP-5 and MA-10232)

105.

Functional Reinnervation of Adult Neostriatum by Fetal Substantia Nigra Grafts: An Ultrastructural Immunocytochemical and *In Situ* Hybridization Study

I. MENDEZ, K. ELISEVICH and B. FLUMERFELT (London, Ontario)

Evidence for nigro-striatal synaptic restoration and reversal of behavioural and biochemical deficits in dopamine (DA) depleted adult neostriatum by fetal substantia nigra grafts is well documented. Neither the neurochemical nature of the host postsynaptic target nor the gene expression for continued DA synthesis by the graft has been characterized. This study identifies immunocytochemically the neurotransmitter profiles of deafferented host striatal neurons which receive graft derived dopaminergic fibres and demonstrates continued graft neuronal mRNA expression for tyrosine hydroxylase (TH) using *in situ* hybridization. Fetal substantia nigra cell suspensions were stereotaxically implanted into the deafferented neostriatum of rats two weeks after a 6-hydroxydopamine nigral lesion. Animal locomotor activity postgrafting was assessed pharmacologically using apomorphine and amphetamine. DA neurons were demonstrated in grafts using antibodies raised against TH. Host striatal neurons containing substance P (SP), choline acetyltransferase (ChAT) and glutamic acid decarboxylase (GAD) were also identified immunocytochemically. Simultaneous dual identification of antigens was achieved with the peroxidase-anti-peroxidase method (PAP) using two different chromogens -3′,3′- diaminobenzidine tetrahydrochloride (DAB) and benzidine dihydrochloride (BDHC). Graft TH mRNA expression was assessed with a 35S-radiolabelled anti-sense oligonucleotide TH probe. Recovery of motor symmetry was seen routinely in grafted animals. TH +ve terminals of graft-derived axons made synaptic contact with SP +ve cell bodies and dendrites, ChAT +ve cell bodies and GAD +ve dendrites. Dramatic evidence of graft TH mRNA expression was seen up to nine months postgrafting. This study demonstrates restoration of nigrostriatal circuitry at the same time as rotational behavioural improvement and persistent DA expression by the graft within the host striatum.

106.

Experimental Chronic Brain Hypoperfusion Kills Hippocampal Neurons

J.C. de la TORRE, T. FORTIN, J. SAUNDERS, K. BUTLER and M. RICHARD (Ottawa, Ontario)

Degenerative dementias can result in hippocampal neuron damage following reduced cerebral blood flow (CBF). Since little information is available on the chronic effects of partial ischemia, we developed a brain hypoperfusion model to study the neurochemical and structural changes in CA1-CA4 hippocampal subfields.[1] Rats had both carotids and one subclavian artery occluded, leaving only the right vertebral artery to supply the brain. Rats' CBF and brain energy metabolites were measured 1-12 weeks after hypoperfusion using 31P-magnetic resonance spectroscopy *in vivo*. Rats were then perfused with 1 ml carbon dye i.v. to assess cerebrovascular filling defects. After sacrifice, brain was removed for histologic examination. Results show the right hippocampus and parietal cortex had fewer dead neurons than occluded contralateral counterparts. CA1-CA4 cell death increased progressively over time and was highest on week 12. CBF was reduced 45% (from 138 to 77 ml) with slightly lower values in the occluded hemisphere. 31P-spectra showed reduced PCr/ß-ATP levels as compared to controls. Motor behavior was slightly depressed in all hypoperfused rats. Our results indicate that structural, metabolic and physiological changes develop in rats after chronic brain hypoperfusion. This model may be useful in simulating human vascular dementias.

[1]de la Torre JC, Fortin T. Soc Neurosci Abstr 1988; 14: 1211.

Cerebrovascular

107.

Surgical Management of Unruptured Intracranial Aneurysms

A.M. KAUFMANN, K. REDDY, M. WEST and G. SUTHERLAND (Winnipeg, Manitoba)

Incidentally discovered intracranial aneurysm and symptomatic unruptured aneurysms produce subarachnoid hemorrhage (SAH) at an estimated rate of 1 to 3% and 6.25% per annum, respectively. The precise indications for prophylactic repair of incidental aneurysms is not clearly defined.

This retrospective review examines characteristics and outcome of all patients undergoing surgical treatment of unruptured intracranial aneurysms in Winnipeg between 1982 and 1989. Cases with intact aneurysms repaired concurrently with associated ruptured aneurysms were excluded. Forty-six patients presented with incidental aneurysms discovered during investigation of SAH (22) or unrelated conditions (24). Symptomatic unruptured aneurysms were treated in 7 patients. Small incidental aneurysms were found to enlarge on routine follow-up angiography in 4 patients, prompting surgical repair.

Surgery was undertaken to treat 66 intact aneurysms with diameter 10 mm or greater in 37 cases, and less than 10 mm in 19 cases. Multiple aneurysms were treated in 9 of these cases. No surgical mortality was encountered. Three major complications arose among the 56 cases (5.4%). Two patients incurred partially resolving hemiparesis following clipping of a 12 mm and a 9 mm aneurysm. The third complication arose after clipping a 10 mm superior cerebellar artery aneurysm and 2 anterior circulation aneurysms, although the patient recovered to baseline in 2 months. Nine patients experienced transient neurological deficits related to technically difficult procedures for large intact aneurysms.

While most neurosurgeons agree with prophylactic clipping of incidental aneurysms 10 mm or greater in diameter, the indications for surgical repair of smaller aneurysms is not well defined. The demonstrated enlargement of these small aneurysms and especially low risk associated with their repair, suggests all surgically accessible incidental aneurysms should be considered for surgical treatment.

108.

Preoperative Cerebral Blood Flow Predicts Early Deterioration in Patients with Aneurysmal Subarachnoid Hemorrhage

G.G. FERGUSON, J.K. FARRAR (London, Ontario)

We measured cerebral blood flow (CBF) immediately prior to surgery in 91 patients with recent subarachnoid hemorrhage (SAH), and compared the preoperative flow values to the patients' early postoperative clinical status. The CBF data were grouped in intervals of 5 ml/100g/min, and postoperative status was classified as deteriorated if there was a decrease in neurological status within the first week.

When preoperative CBF was above 40 ml/100g/min, 18/51 patients (35%) showed early postoperative deterioration regardless of the exact preoperative flow (35%, 36% and 33% in the 40-44, 45-59 and 50+ flow ranges). In the 35-39 flow range, the percentages were reversed with 16/25 patients (64%) showing early deterioration and at flows below 35, 80% deteriorated (12/15). The increase in postoperative deterioration at flows less than 40 ml/100g/min was not related to reduced clinical grade. 13/25 (62%) of Grade I patients in the 35-39 flow range and 9/15 (78%) in the <35 flow range deteriorated following surgery. We conclude that the risk of early postoperative deterioration increases sharply in patients with ruptured aneurysms in whom preoperative CBF is below 40 ml/100g/min, and is proportional to the reduction in flow.

109.

Correlation Between Cerebral Blood Flow, Somatosensory Evoked Potential and CT Scan in Patients with Subarachnoid Hemorrhage

M. FAZL, D.A. HOULDEN and K. WEAVER (Toronto, Ontario)

Cerebral blood flow (CBF) and central conduction time through the brain (CCT) were recorded from 58 subarachnoid hemorrhage patients and from 49 age matched controls. CBF was calculated from the initial slope index following Xenon inhalation. CCT was determined from the interpeak latency between the P/N13 somatosensory evoked potential (SSEP) waveform generated at the cranio-cervical junction and the N20 SSEP waveform generated near the sensorimotor cortex following median nerve stimulation. CCT, CBF and neurological grade (Hunt and Hess Classification) were concomitantly recorded 1, 4, 7 and 14 days after subarachnoid hemorrhage. Each patient had a CT scan on the day of admission which was graded from I-IV depending on the amount of blood in the subarachnoid space.

Mean CBF was highest in patients with neurological grades 1 and 2 (48.6 ± 10.3 ml/100 gm/min) and lowest in patients with neurological grade 4 (37 ± 9.6). Neurological grade and CT scan grade correlated with CBF ($P<0.0001$) better than CCT ($P = 0.015$). The patients in neurological grades I and II did not have significantly different mean CBF's and patients in neurological grades I, II and III did not have significantly different mean CCT's. In contrast, patients in neurological grade IV had mean CBF and CCT measurements that were significantly different from those obtained from patients in neurological grade I or II ($P<0.05$). It appears that prolonged CCT is associated with a drop in CBF only when CBF drops below a certain threshold.

Key Words: Cerebral aneurysm, subarachnoid hemorrhage, evoked potentials; somatosensory, cerebral blood flow, cerebral ischaemia.

110.

Neuropsychological Sequelae Following Early and Delayed Surgery for Anterior Communicating Artery Aneurysms

F. GENTILI and J. RIDGLEY (Toronto, Ontario)

The present study was undertaken to determine whether early operation in patients with ruptured anterior communicating artery (ACoA) aneurysms is associated with poorer functional outcome, particularly in terms of more severe cognitive and behavioural dysfunction when com-

pared with delayed surgery. Of 67 patients presenting with ACoA aneurysms from 1982 to 1988, 32 underwent late surgical repair (greater than 4 days) and 25, early surgery (day 1-3). The average follow-up for the early surgery group was 1.3 years (1-5 years) and 1.4 years (1-5 years) for the delayed group. A comprehensive neuropsychological evaluation was performed to determine the quality and nature of cognitive function. Interviews to determine emotional adjustment, self-management, and social behaviour were also carried out.

Early surgery resulted in significantly improved management mortality rates. The incidence, pattern, and distribution of cognitive and psychosocial sequelae after early operation did not differ substantially from those patients undergoing delayed operation. When functional morbidity in terms of persistent cognitive and psychosocial impairment was included in outcome assessment, the overall favourable results were significantly decreased in both groups. Our findings of improved management mortality and at least comparable management morbidity with early surgery offers further argument for early clipping in this group of patients.

It is concluded however that subarachnoid haemorrhage from ACoA aneurysm is associated with significant long-term neuropsychological morbidity, even in patients having an excellent physical outcome.

111.

Intrathecal Injections of Oxyhemoglobin and Bilirubin Cause Cerebral Vasospasm in Primates

R.L. MACDONALD, B.K.A. WEIR, K. SAITO, K. KANAMARU, J.M. FINDLAY and M.G. GRACE (Edmonton, Alberta)

The agent or agents responsible for cerebral vasospasm (VSP) are unknown but one theory holds oxyhemoglobin responsible. Whether oxyhemoglobin acts alone or in concert with other chemicals is unknown.

A primate model of VSP was developed in which cynomolgous monkeys underwent microsurgical dissection of the basal cisterns and exposure of the right middle cerebral artery (MCA). An ommaya reservoir was placed in the subcutaneous tissue and connected to a catheter coursing along the right MCA. Animals were entered by restricted randomization into five experimental groups to receive twice daily injections for six days. Groups included supernatant of incubated blood and mock cerebrospinal fluid (CSF) (n = 4), oxyhemoglobin (n = 3), methemoglobin (n = 2), bilirubin (n = 3), and mock CSF (n = 3). Total doses of injected hemoglobin (750 mg) and bilirubin (27 mg) were equivalent to amounts potentially released from a 5 ml blood clot.

Comparison between day zero and day seven angiograms revealed statistically significant reduction in right MCA diameter only in the supernatant group (28%, pair t-test, $p<0.05$). Trends were noted in reduction of right MCA diameter with oxyhemoglobin (19%) and bilirubin (17%). Methemoglobin and mock CSF were without effect. Enrollment of primates in the study is ongoing (n = 8 per group).

These results implicate oxyhemoglobin and bilirubin as important in the genesis of VSP in the primate. Pathologic examination of the vessels and biochemical analysis of CSF is in progress.

112.

Endothelial Cell Function in Cerebral Vascular Malformations: An *in vitro* Study Suggesting a New Paradigm

R. LEBLANC, Y. COMAIR and Y. ROBITAILLE (Montreal, Quebec)

Cerebral vascular malformations (CVM) cause neural symptoms by hemorrhage or by progressive cerebral ischemia due to shunt flow. The etiology of CVMs and their resistance to spontaneous thrombosis remain unexplained and their biological activity unexplored. To address these questions we have studied 6 arteriovenous malformations (AVM), and 5 cavernous angiomas by assessing their uptake of factor VIII, a marker of endothelial cell function, and their response to estrogens (which have been associated with spontaneous regression of some AVMs).

Six freshly excised AVMs were transported in CMF-Hank's solution on ice, separated into multiple small fragments, repeatedly washed to remove blood clots, and separated into two fractions each incubated in 20 ml of DMEM-in 5% CO_2 for 12 hours. 17-ß estrodiol was added to one of the fractions of each incubated AVM. Each fraction was then embedded in paraffin, and reacted with immunoperoxidase-labelled factor VIII-related antigen. Five surgically resected cavernous angiomas were directly fixed, paraffin embedded, and factor VIII activity was demonstrated as outlined above. Factor VIII immunoreactivity in the non-estrogen treated fractions of the AVMs and in the cavernous angiomas was compared by light microscopy to that of normal arteries. Untreated AVM fractions and cavernous angiomas reacted more intensely and more extensively for factor VIII than did the controls and the estrogen-treated fractions. The latter suggests that estrogen triggered release of factor VIII from endothelial cells into the culture medium.

These data suggest that CVMs are metabolically active and that this activity can be altered by biological substances such as estrogen. CVMs may be submitted to trophic effects of endothelial or platelet-derived growth factors.

113.

Clinical Application of Activation — Positron Emission Tomography in the Assessment and Treatment of Cerebral Arteriovenous Malformations

R. LEBLANC and E. MEYER (Montreal, Quebec)

Positron Emission Tomography (PET) scanning can demonstrate activation of cerebral blood flow and metabolism in the pre-central gyrus, supplementary motor area and thalamus in response to voluntary movement, and of the post-central gyrus with vibrotactile stimulation. PET scanning can also demonstrate structural lesions, such as cerebral arteriovenous malformations (AVMs).

We report the first instance of the use of functional PET scanning to precisely localize a structural brain lesion, an AVM, to the pre-central gyrus, and the first direct validation of functional PET scanning by intra-operative cortical mapping. The AVM had produced a generalized seizure in an otherwise asymptomatic young woman. PET scans were performed after the intravenous injection of 40mCi of oxygen -15 labelled water to measure regional cerebral blood flow, with data collected over 2-1 minute periods for a total duration of 2 minutes. A first, resting or baseline PET scan identified the AVM. A second PET scan, performed during vibrotactile stimulation of the contralateral hand, identified the cortical somato-sensory hand region, and localized the AVM to that part of the pre-central gyrus immediately in front of it. This relationship and localization were confirmed by cortical mapping of the pre- and post-central gyri at the time of craniotomy under local anesthesia.

Functional PET scanning is useful to precisely localize eloquent cortical regions and helps in determining the best form of treatment for lesions, especially AVMs, in functionally important cortex either by direct surgical resection or by stereotaxically focused radiotherapy. This technique is now part of our treatment protocol and has benefitted other patients with similar pathologies and structure-function relationships.

Poster Presentations

THURSDAY, JUNE 28, 1990

General Neurology

P1.

Palmar Stimulation in Polyneuropathy and Carpal Tunnel Syndrome

M.L. D'AMOUR (Montreal, Quebec)

Hand numbness is a frequent symptom in polyneuropathy. However, in an occasional patient, hand numbness has some additional clinical characteristics of a carpal tunnel syndrome. In such cases, it is difficult to evaluate the relative importance of both diseases and the appropriate treatment. To find out if there is a preferential involvement of a median nerve segment in either entity, the following study was undertaken.

Twenty-five patients with polyneuropathy (PN), 8 patients with polyneuropathy and additional characteristics of carpal tunnel syndrome (PN+), 25 patients with carpal tunnel syndrome alone (CTS) and 25 normal subjects were evaluated.

Orthodromic median nerve sensory conduction velocities (M/sec) were calculated in different segments. Median motor distal latency was measured (msec).

SEGMENTS	GROUPS (Mean + SD)			
	PN	PN+	CTS	N
1. Middle finger to wrist	32.3*	27.7**	42.8	61.6
	21.	23.1	19.2	7.3
2. Middle finger to palm	33.6**	31.7*	45.8	60.5
	18.8	28.0	18.8	6.3
3. Palm to wrist	33.1*	36.6	41.2	64.0
	18.4	9.6	16.7	6.9
4. Motor distal latency	5.8	5.3	4.9	3.2
	2.8	1.1	1.0	.46

PN or PN+ vs CTS: P<.05:*; P<.01:**

These results demonstrate a greater reduction of median nerve sensory conduction velocities in all three segments in polyneuropathy and polyneuropathy with additional characteristics of carpal tunnel syndrome as compared to carpal tunnel syndrome alone. However, it is impossible to differentiate patients with polyneuropathy who might need surgical decompression of the median nerve at the carpal tunnel. For each group, there is no significant slowing of the palm to wrist segment as compared to middle finger to palm segment.

P2.

Cerebral Toxoplasmosis in Acquired Immunodeficiency Syndrome (AIDS): Effective Long Term Management with Clindamycin and Pyrimethamine

S.D. CLARKE and J.P. HOOGE (Vancouver, British Columbia)

The current treatment of choice for cerebral toxoplasmosis in persons with AIDS is sulfadiazine combined with pyrimethamine. Many patients develop severe allergic reactions to sulfadiazine necessitating discontinuation of the drug. Cerebral toxoplasmosis in this setting is uniformly fatal without life-long antibiotic therapy.

We report clinical and radiological details of two men with AIDS and cerebral toxoplasmosis. Both had a good initial clinical response to sulfadiazine/pyrimethamine but because of skin rash the sulfadiazine had to be stopped. Oral clindamycin combined with pyrimethamine was substituted and has been well tolerated and effective over seven months. Neither patient has shown clinical or radiologic evidence of recurrence of cerebral toxoplasmosis.

Further studies are required to determine the minimal dose of clindamycin which is effective for this disease.

P3.

Marked Plasma Hyperviscosity due to Waldenstrom's Macroglobulinemia presenting clinically as Alzheimer's disease — a case of Bing Neel Syndrome

M. HOFFMANN and D. ADAMS (St. John's, Newfoundland)

A 72-year-old man presented with a progressive short term memory loss, behavioural disturbance and Dysnomia over a 3 year period.

The cognitive impairment was clinically of the Alzheimer's type, the serum viscosity was elevated approximately 8 times above the normal and the computerized tomography scan showed signs of gray and white matter hypoperfusion or chronic ischemia.

After treatment with plasmapheresis and Chlorambucil his haematological abnormality improved as did his cognitive impairment. This was documented by serial neuropsychological testing and was also evidenced by radiological improvement on the computerized tomography scan.

We feel this patient's diagnosis is consistent with the Bing Neel Syndrome and attention is drawn to the haematological hyperviscosity states presenting as a dementia clinically indistinct from Alzheimer's and the prospects of reversing such a dementia with the appropriate treatment.

P4.

Spontaneous Orthostatic Headache: Cisternographic Findings and Therapeutic Implications

E. FRENETTE, J. REIHER and J. VERREAULT (Sherbrooke, PQ)

Spontaneous orthostatic headache (SOH) is characterized by recurrent bouts of severe headache over a period of 3 to 5 weeks. The cephalalgias are triggered or exacerbated by standing and relieved by recumbency. They can be aggravated by lumbar puncture which further lowers an already low CSF pressure. Treatment has consisted mainly of prolonged bed rest.

We herein report distinctive cisternographic findings of relevance for the understanding of SOH symptomatology and for the rational selection of a uniformly and rapidly effective mode of treatment.

A radionuclide cisternography was carried out in 3 of 7 patients with SOH. In each one, but in none of the controls referred for investigation of low-pressure hydrocephalus, a characteristic thoraco-lumbo-sacral Christmas tree pattern was observed, along with rapid urinary tract excretion of the tracer. Following an epidural autologous blood patch, all three patients reported immediate and durable relief from headache; the Christmas tree pattern was less obvious and more limited to lumbo-sacral segments in the sole control examination performed.

Cisternographic data before and after therapeutic blood patch suggest that an accelerated CSF spinal reabsorption can readily explain the decreased CSF pressure of untreated SOH. The initially increased CSF clearance is sufficiently corrected by a simple blood patch to account for headache subsidence.

P5. Withdrawn

P6.

Dementia with Leukoencephalopathy in Systemic Lupus Erythematosus

A. KIRK, A. KERTESZ and M. POLK (London, Ontario)

Neurologic manifestations, afflicting up to 70% of SLE patients, include psychosis, seizures, chorea, neuropathies, and stroke. MRI is useful in evaluation of lupus patients and several reports have documented the appearance of cerebral atrophy or focal hyperintensities. We report an unusual MRI appearance in a 56-year-old woman with SLE,

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diagnosed on the basis of pleuritis, lymphopenia, anti-DNA antibodies, and neurologic involvement. She reported recent onset of Raynaud's phenomenon and generalized macular rash. She presented after two months of gradual deterioration with memory loss, flattened affect, dysphagia, dysarthria, anomia, and somnolence, without focal neurologic signs. Investigations included elevated ESR, reduced complement, normal hormone and vitamin levels, normal renal and hepatic function. Neuropsychologic testing showed widespread impairment (WAIS-R: FS IQ-63; WMS-69; DRS-98; RCPM-14, WAB AQ-78.8). CT was normal but MRI showed strikingly symmetric, confluent hyperintensities extensively involving cerebral and cerebellar white matter on T2 weighted scans. Basal ganglia and subependymal and subcortical white matter were spared. Treated with prednisone, the patient made a gradual, but incomplete recovery. These MRI findings may reflect widespread vasculopathy, immunologic blood-brain barrier disruption, or direct immunologic brain insult.

P7.

Primary Isolated Intracerebral Blastomycosis: Diagnosis and Treatment with a New Antifungal Agent: Fluconazole

G.A. L'ESPÉRANCE and A. VINCENT (Lévis, Quebec, PQ)

Blastomycosis is a rare systemic fungal infection caused by "BLASTOMYCES DERMATITIDIS". Usually pulmonary at the beginning, the infection process can spread to other systems, most often skin, bone and genito-urinary organs. Cerebral nervous system (CNS) involvement is rare and almost always a late manifestation of a disseminated blastomycosis, with hematogenous spread from a pulmonary source. Meningitis and cerebral abscess are two presenting forms of the CNS involvement: there is no pathognomonic picture of this illness and the neurologic signs can arise without signs elsewhere. Finding on CT-Scan may be similar to those of a malignant glial tumor. CNS involvement is best treated by amphotericin B I.V., which is however nephrotoxic. A new oral antifungal agent, FLUCONAZOLE, seems promising and is actually under experimentation for the pulmonary disease.

We present a case of primary isolated intracerebral blastomycosis in a 76-year-old, otherwise healthy male patient, presenting with symptoms of a space occupying lesion. The initial clinical diagnosis was primary glial tumor. Biopsy confirmed the fungal lesion, while the clinical and biological assessments were negative for other localisation. The patient was reoperated for a recurrence while under amphotericin B and the evolution with FLUCONAZOLE is favorable. We believe that this case is unique by its clinical presentation and by the experimental and promising therapeutic regimen used.

P8.

An Epidemiologic Study of Multiple Sclerosis in the Crows Nest Pass and Cardston Regions of Southern Alberta

G.M. KLEIN, T.P. SELAND, L. BARCLAY and A. VAN ORMAN (Calgary, Alberta; Cardston, Alberta)

Reports of high prevalence rate for multiple sclerosis in Southern Alberta led to an epidemiologic study of this disease in the Crows Nest Pass and Cardston Regions. In Cardston, the prevalence rate for multiple sclerosis was 87 per 100,000. In the Crows Nest Pass, the prevalence rate was 202 per 100,000. Previous large studies of the prevalence rate of multiple sclerosis in Western Canada have shown rates between 93 and 111 per 100,000. The prevalence rate in the Crows Nest Pass is therefore higher than expected.

P9.

The Cost Effectiveness Evaluation of the Canadian Cooperative Study of Cyclophosphamide and Plasma Exchange in Multiple Sclerosis

R.M.W. BULLAS, A. LAUPACIS, M.K. VANDERVOORT and J.H. NOSEWORTHY (London, Ontario)

The cost effectiveness of 3 therapies for progressive multiple sclerosis was evaluated in the blinded, randomized Canadian Cooperative clinical trial. The therapies were: Group I: in hospital IV cyclophosphamide and prednisone, Group II: outpatient daily oral cyclophosphamide and alternate day prednisone (22 weeks) and 20 weekly plasma exchanges, and Group III: placebo medications and sham plasma exchange. Resource utilization was derived from a retrospective chart review of 43 patients (15 in Groups I and II, 13 in Group III) and costs were calculated using a fully allocated costing system. Costs relevant for the health care system in subsequent delivery of therapy (costs of sham exchange excluded) in each of the three trial arms were $11,055 Group I, $15,893 Group II, and $9,166 Group III. The major portions of these costs were: Group I: hospitalizations (including exacerbations) $7,842, Group II: plasma exchange $9,316 and Group III: treatment of exacerbations $7,708. The trial ended on December 31, 1989 and data analysis will be completed by May 1, 1990 at which time the cost effectiveness of the 3 treatments will be calculated (cost per stabilization and per 1.0 decrease in Expanded Disability Status Scale score at one year). This information will aid in determining resource allocation for patients with multiple sclerosis.

P10.

Microangiopathic Syndrome of Encephalopathy, Retinal Vessel Occlusion and Hearing Loss

E.A. KAMINSKA, M. SADLER, V. SANGALANG, A. HOSKINMOTT and D. SILVERBERG (Halifax, Nova Scotia; Moncton, New Brunswick)

A microangiopathic syndrome of diffuse encephalopathy, hearing loss, and retinal artery branch occlusion has been previously described (Montiero M et al *Neurology* 1985; 35: 113-1121). Only eight cases, all young women, have been reported.

In August 1989 a previously healthy 26-year-old male developed abrupt partial right eye visual loss secondary to retinal artery branch occlusion. Over the next month he developed right sided hearing loss mild right hemiparesis, bilateral extremity incoordination, expressive-receptive dysphasia, urinary incontinence, and behavior changes. A transient macular rash was the only non-neurologic symptom or sign. There was no history of drug abuse.

CT scans and cerebral angiography were normal; an MRI scan demonstrated several small discrete white matter lesions suggestive of infarction. The EEG was diffusely slow. The CSF, other than a raised protein on one occasion, was normal (including negative oligoclonal banding). Cardiac investigations were normal. Serum studies for collagen vascular disease (including anti-cardiolipin antibodies) and infectious agents (including Lyme disease and HIV) were negative. Brain biopsy demonstrated multiple discrete microscopic areas of necrosis, mild arteriolar wall cellular proliferation, and occasional lymphocytic infiltration of the vessel wall. The histology was typical of that described in previously reported cases of this syndrome.

Treatment with cyclophosphamide and steroids was initiated in October 1989. A substantial clinical improvement was noted in 2 weeks and has continued as of January 1990.

This is the first male to be reported with a very rare but distinctive CNS syndrome. As in previous reports, cyclophosphamide and steroids have been therapeutically helpful.

Neuro-Ophthalmology

P11.

Positional Amaurosis in Giant Cell (Temporal) Arteritis

P. NAUD (Sherbrooke, Quebec)

Visual impairment occurs in 30% to 50% of patients with giant cell arteritis (GCA) and consists of a transient or permanent loss of vision, or diplopia. The cause of visual loss in GCA is usually an acute anterior ischemic optic neuropathy. A few cases of positional amaurosis in patients with GCA have been previously reported but a possible atherosclerotic causal factor could not be entirely excluded. We report a 70-year-old patient who had repeated episodes of orthostatic, right monocular blindness refractory to high-dose Prednisone and adequate intravenous Heparin regimen. All episodes of visual loss occurred upon standing up and lasted from 15-60 minutes. Neurological and ophthalmological examinations were normal. A right carotid arteriography was normal and there was no significant stenosis of the ophthalmic artery. A temporal artery biopsy confirmed the diagnosis of GCA. The patient was treated with strict bed rest for 3 days and experienced no recurrence of monocular blindness. He was discharged on Coumadin and high dose Prednisone. We postulate that positional amaurosis in GCA is secondary to reduced perfusion in the central retinal artery resulting from a fall of the systemic arterial pressure in narrowed, arteritic vessels.

P12.

Complete Ophthalmoplegia Complicating Corticosteroid and Pancuronium Associated Myopathy

B.G. WEINSHENKER, L.D. SITWELL, V. MONTPETIT and D. REID (Ottawa, Ontario)

We observed acute complete external ophthalmoplegia in the context of a severe myopathy in a 45-year-old man admitted with status asthmaticus. The patient had been treated with high doses of intravenous methylprednisolone and pancuronium. Myopathy was documented by muscle biopsy and was also supported by elevations in serum muscle enzymes, and by myopathic EMG abnormalities. Acute myopathy associated with pancuronium and high dose corticosteroid administration has been previously reported but this is the first description of complete ophthalmoplegia occurring in this setting. The diagnostic considerations entertained in this patient, the muscle pathology and the pathophysiology of this rare syndrome will be discussed. Awareness of this complication in a common clinical setting is necessary to avoid confusion with other causes of acute weakness and ophthalmoparesis.

P13.

Early Saccadic and Vestibular Abnormality in Progressive Supranuclear Palsy

E.E. BENJAMIN and B.T. TROOST (Charlotte, North Carolina; Winston-Salem, North Carolina, U.S.A.)

Supranuclear paralysis of vertical gaze is the hallmark of Progressive Supranuclear Palsy (PSP). Patients affected with this disorder commonly present with falling episodes due to postural instability and impaired visual perception. A case is presented in which saccadic latency delays and abnormal vestibular responses were noted as early findings in a patient who subsequently developed overt manifestations of PSP.

An elderly woman presented with a complaint of dizziness and visual blurring while walking. She noticed unsteadiness and fell frequently. Initial examination was normal except for inaccurate tandem gait due to frequent side stepping. A computerized electronystagmogram (ENG) and ocular motility recordings were analyzed. Horizontal and vertical saccades showed slowing and increased latencies in the 400-500 msec range. The latency delays were slightly more marked for vertical saccades. Caloric vestibular responses were weak bilaterally. Brief ice water stimulation showed failure of fixation suppression.

The patient was re-evaluated a year and a half later for worsening symptoms. Examination then revealed a staring facies, vertical ophthalmoparesis, and severe postural instability consistent with a diagnosis of PSP. There was no clinical improvement with dopaminergic therapy.

This case study shows that in a patient with PSP: 1. Saccadic latency delay and slowing may be present before clinically evident ophthalmoparesis. 2. Vestibular dysfunction may contribute to gait instability.

P14.

Deficits in the Visual Perception of Moving Patterns in Multiple Sclerosis

J.E. RAYMOND, S.M. DARCANGELO and T.P. SELAND (Calgary, Alberta; Vancouver, British Columbia)

Many patients with Multiple Sclerosis (MS) experience disruptions in vision. Although deficits in the visual perception of luminance contrast, spatial frequency, colour, and/or flicker have been reported in these patients, little or no research has been conducted to investigate whether motion perception problems may also occur. In the present study, we measured the ability of MS patients (5 with contrast sensitivity and other subtle visual deficits and 5 with normal vision) and an equal number of healthy control subjects to judge the speed of moving grating patterns. All patients had normal acuity and a "definite" diagnosis of MS. Subjects viewed a circular field which was bisected vertically. Half the field contained a medium spatial frequency grating pattern drifting leftward and the other half contained the same grating pattern drifting rightward. The subject's task was to match the speed of one half of the field to that of the other half. The speed and contrast of the half to be matched were varied from trial to trial. It was found that all MS patients, even those with "normal" vision, were significantly less accurate at matching velocity than control subjects. Moreover, all MS patients showed greater variability in judgements than controls. An oculomotor basis for this difference was eliminated by an investigation of eye movements of all subjects during the task. These data support previous studies that showed MS to be associated with deficits in the visual processing of temporal change in visual stimuli and suggest that MS patients may experience difficulties in judging the speed of moving objects or themselves in "real" world situations.

P15.

Inability of Multiple Sclerosis Patients to Maintain an Accommodative Response

N.A. OGDEN, J.E. RAYMOND and T.P. SELAND (Calgary, Alberta)

Patients with Multiple Sclerosis (MS) frequently report transient blurring of vision in spite of normal or near normal visual acuity. This study reports abnormal accommodative control in MS and its contribution to visual perceptual deficits. Sustaining an accommodative response is known to be effortful and, since abnormally rapid fatigue on exertion is a hallmark of MS, we hypothesized that blurring episodes may occur as a result of loss of accommodative control. Accommodative range, tonus position of accommodation, contrast sensitivity, and the ability to sustain an accommodative response were measured in 10 MS patients and an equal number of healthy control subjects. Sustained accommodation was measured by having subjects view a small randomly changing alphanumeric character for a prolonged period (2 min) and the subject was required to signal the change with a button press. RT's measured at viewing distances that corresponded to the tonus position of accommodation (where accommodation is least effortful) were compared to RT's for stimuli viewed at other

distances. As expected, MS patients had mean RT's about 350 msec longer than controls for all viewing distances. They showed a normal range of accommodation and a normal distribution of tonus positions. However, it was found that for viewing distances closer than that corresponding to the tonus position, MS patients showed a significantly reduced ability to sustain accommodation. These data suggest that dioptric factors are an exigent aspect of visual abnormality in the MS patient and that visual discomfort may be easily ameliorated by optical adjustment of the tonus position to the patient's most commonly used viewing distance.

P16.

The Chalky-White Fundus in Arteritic Anterior Ischemic Optic Neuropathy

S. HOUDE, F. MATHIEU-MILLAIRE and D. BOGHEN (Sherbrooke, Quebec; Montreal, Quebec)

A chalky-white fundus has been observed in arteritic anterior ischemic optic neuropathy (AION). Hayreh[1] has best described this finding and states that in itself it justifies a temporal artery biopsy.

We have seen 6 patients with biopsy proven arteritic AION presenting with a chalky-white fundus. Each patient showed decreased visual acuity, a relative afferent pupillary defect and abnormal color vision on the affected side. Ophthalmoscopic examination revealed a swollen optic disk with a thick, chalky-white mass lying deep to the transparent nerve fiber layer and retinal vessels. Only one patient also had a few peripapillary hemorrages.

According to Hayreh the chalky-white fundus develops following massive ischemia of the laminar and retrolaminar areas of the optic disk. This territory is highly dependent upon posterior ciliary artery (PCA) circulation. The PCA can be involved in temporal arteritis, as shown by microscopic examination.

More emphasis on the chalky-white fundus is warranted since it may lead to earlier recognition of arteritic AION, a potentially blinding disease.

[1]Beri M, Hayreh SS. Anterior ischemic optic neuropathy. Ophthalmology 1987; 94: 1020-1028.

P17.

Low Contrast Visual Acuity in Neuro-Ophthalmological Disorders

D. REGAN (Toronto, Ontario)

Our low contrast acuity charts were designed to provide a simple means of detecting hidden visual loss in patients with normal visual acuity. They can also identify a visual pathway component of loss in patients with reduced acuity. The test procedure resembles the familiar Snellen acuity procedure. The ratio between visual acuities for high-contrast and low-contrast letters were abnormal at the highly significant level (>2.5 SD from the control mean) in 10/18 patients with Multiple Sclerosis (6 with 6/7.5 acuity or better), 7/20 patients with Parkinson's disease (5 with 6/6 acuity) and 7/15 diabetics (6 with 6/6 acuity). Physiological evidence suggests that an abnormal test result indicates damage in a pathway that runs through the magnocellular layers of the lateral geniculate body (LGN), while depressed visual acuity that is not caused by front of the eye abnormality indicates damage in a pathway that runs through the parvocellular layers of the LGN.

P18.

Bilateral Cerebral Ptosis with Discrete Internal Capsular Infarction

C.L. VOLI. and A. SHUAIB (Saskatoon, Saskatchewan)

The term "cerebral ptosis" denotes deficient tone of the levator palpebrae superioris caused by a supranuclear lesion. Eyelid muscle tone is subject to cortical control, yet the neuroanatomical pathways remain ill-defined. Bilateral cerebral ptosis (BCP) has been reported following bifrontal left and right hemispheric hemorrhage or infarction. To date however, BCP has been described only in association with extensive hemispheric lesions, and previous reports have emphasized the high mortality associated with this neurologic sign. We describe two cases of persistent asymmetric BCP and conjugate gaze weakness in association with discrete subcortical infarctions involving the internal capsule. Significant functional improvement occurred in both patients. In our second case there was persistent BCP associated with a discrete lesion in the anterior portion of the posterior limb of the internal capsule. This is by far the smallest and most discrete anatomical site of pathology so far documented in a case with BCP and indicates that the pathway controlling levator palpebrae tone passes through this region of the internal capsule.

Movement Disorders

P19.

Segmental Myoclonus, Paroxysmal Horner's Syndrome and Oculosympathetic Spasm

W.A. FLETCHER and M.A. LEE (Calgary, Alberta)

A 28-year-old woman had continuous jerking in her left hand since delivery of her last child four years earlier. It persisted during sleep. A year later she developed recurrent short episodes of left facial flushing and miosis followed by transient left mydriasis. The frequency of episodes had increased to twice daily. Triggers included exercise and alcohol.

Between episodes both pupils were 3.5 mm and responded normally to bright light, darkness and 4% cocaine. Each episode began with left miosis (3.0 mm), scleral injection and left ptosis lasting one to three minutes. A second phase of left mydriasis (4.0 mm) and eyelid elevation lasted from 30 to 50 sec. A slight ulnar jerk of the left little finger and wrist occurred 36 times per minute at slightly irregular intervals. There was mild wasting of left hypothenar and thenar muscles and weakness of abduction of left little finger and thumb. The left triceps reflex was hyperactive. Sensation was normal.

EMG showed synchronous discharges in flexor carpi ulnaris, 1st dorsal interosseous, pronator teres and triceps but not in C8 or T1 paraspinal muscles. MRI showed within the cervical spinal cord an area of low signal intensity interpreted as a syrinx by one radiologist and as truncation artifact by others.

Carbamazepine abolished the paroxysmal episodes but not the jerking. They resumed without carbamazepine.

Paroxysmal oculosympathetic spasm usually signifies a chronic lesion of cervical spinal cord. It has been reported with congenital Horner's syndrome and after thyroidectomy. Although there is often an underlying acquired oculosympathetic paresis paroxysmal Horner's syndrome preceding the spasm has not been noted before. Two case reports of oculosympathetic spasm and probable syringomyelia have described involuntary contractions and wasting of muscles innervated by lower cervical nerve roots. However, the muscle contractions were sustained and several minutes apart unlike the unremitting myoclonus observed in our case.

P20.

PET is in Accordance with a Functional Dopaminergic Excess in Hepatocerebral Degeneration

B.J. SNOW, M.H. BHATT, A.J. PROUT, W.R.W. MARTIN and D.B. CALNE (Vancouver, British Columbia)

Chronic hepatic failure may result in a syndrome with chorea, ataxia, dysarthria and orofacial dystonia. It has been proposed that the syndrome derives from a defect in dopaminergic neurotransmission or from

a disturbance in the blood-brain barrier allowing the ingress of "false neurotransmitters". We performed positron emission tomography with the tracer ^{18}F-6-fluorodopa (6FD) on a patient with a 3 year history of hepatocerebral degeneration. We compared the result with 6 age-matched normals. We found that the 6FD uptake rate constant, calculated by a graphical method, was normal; this suggests normal function of the nigrostriatal dopaminergic pathway. However, the radioactivity accumulation in the background regions of the brain was twice that of the controls; this suggests a disturbance of the blood-brain barrier. There were no significant differences in peripheral 6FD metabolism. The movement disorder associated with hepatocerebral degeneration may be due to a disturbance of the blood-brain barrier; this could potentially result in false neurotransmitters producing a functional dopaminergic excess. We treated the patient with the dopamine depleting agent tetrabenazine which improved the orofacial dystonia and chorea. The response to tetrabenazine further supports the concept of excess dopaminergic activity in hepatocerebral degeneration.

P21.

Olfactory Dysfunction in the Amyotrophic Lateral Sclerosis/Parkinsonism-Dementia Complex of Guam (ALS/PD)

J.C. STEELE, R.L. DOTY, D.P. PERL, K.M. CHEN and L.T. KURLAND (Tamuning, Guam; Philadelphia, New York, and Rochester, U.S.A.)

Olfactory dysfunction and impairment of odor identification may be among the first signs of Alzheimer's disease and idiopathic parkinsonism. Because of the similarities between these neurodegenerative disorders and the amyotrophic lateral sclerosis/parkinsonism-dementia complex of Guam, we administered the University of Pennsylvania Smell Identification Test (UPSIT) and the Picture Identification Test (PIT) to 36 persons with ALS/PD and to 42 asymptomatic Guamanian controls.

Of the 25 patients who had predominant parkinsonism without significant dementia, only one evidenced normal olfactory function. Of the 11 patients with ALS, five exhibited markedly diminished olfactory function, four had poor olfactory function, and only two maintained normal function. Of 26 controls under 65 years of age, all but seven showed normal olfaction. PIT scores were 30 or above for all subjects except for one patient with parkinsonism (score 29) and for one control (score 22).

Analysis of covariance revealed that the PD and ALS groups had significantly lower UPSIT test scores than their matched controls.

This impairment of odor identification in ALS/PD will be discussed in light of the theory that airborne agents, etiologically related to this neurodegenerative disease, may gain access to the CNS via the primary olfactory pathways.

P22.

Polyradiculoneuropathy in Olivopontocerebellar Atrophy: An Autopsy Report

B. HOPPE, M.A. LEE, D.G. MUNOZ, E. LOU and A. SHUAIB (Saskatoon, Saskatchewan; Calgary, Alberta; London, Ontario)

The association of polyneuropathy with olivopontocerebellar atrophy (OPCA) has only rarely been reported in the past. In this report we wish to review the clinical and autopsy findings of a case with very unusual presentation.

A 31-year-old female with familial OPCA had been followed for several years with cerebellar dysfunction as her predominant symptom. Six weeks prior to presenting to hospital she noticed an insidious onset of weakness in her legs. Examination showed moderate weakness with no sensory findings. Nerve conductions and nerve biopsy were suggestive of severe mixed peripheral neuropathy. Over the next six months muscle weakness was progressive and involved the upper and lower extremities symmetrically. The patient succumbed from complications of respiratory infections.

Autopsy showed generalized atrophy of the brainstem and cerebellum typical of OPCA. Additionally there was severe loss of motor neurons in the anterior horns in the spinal cord with degenerative changes in the intermediolateral horns and the Clarke's columns. Superimposed inflammatory reaction was present throughout the brain and the spinal cord.

These morphological changes could explain the clinical course of the disease. The relationship of the inflammatory changes in the spinal cord and brainstem to OPCA is however less clear. We will review these morphological changes in relationship to the pertinent literature on OPCA.

P23.

Long and Short Term Endocrine Failure in Patients with Parkinson's Disease after Autologous Transplant of Adrenal Medulla into the Caudate Nucleus

A. MARTINEZ-CAMPOS and E. GARCÍA-FLORES (Monterrey, Mexico)

From August 1, 1987 to August 31, 1988, 24 adrenomedullary transplants into the right caudate nucleus were performed. The results were considered of minimal benefit to the 21 surviving patients of these operations, with an average follow up of 24 months, and for that reason we have stopped performing such operations. In the remaining 20 cases (one lost to follow up) 10 patients with a mean duration of Parkinson's disease of 7 years were further studied in relation to adrenocorticotrophic and thyroid axis. The other 10 patients were less thoroughly studied due to geographical reasons. The results of this investigation are the purpose of this paper.

To our knowledge this is the first endocrine data obtained before and after autologus transplant of the adrenal medulla into the caudate nucleus with a 2 year follow up. In the 10 patients studied we found decreased levels of basal cortisol after three months, one year and two years respectively, our data also showed decreased response of cortisol to hypoglycemia one month post surgery and from then on. Previous reports demonstrate the high incidence of diabetes mellitus in patients with Parkinson's disease. In our clinic of 125 non-operated patients we found 12 patients with diabetes mellitus. This is in accordance with data reported by others (7-10%). In our operated cases 6 out of 24 patients developed diabetes mellitus after surgery, two of which preoperatively had borderline glucose levels. In conclusion it appears that the adrenomedullary transplant in our series not only produced minimal beneficial effects in Parkinson's patients symptoms, but also produced long term deleterious effects on the adrenocorticotrophic and thyroid axis, like decreased cortisol level and a higher incidence of diabetes mellitus. The consequences of these findings could be related to a reduction in the tolerance of stress after adrenalectomy. Its possible role in a more widespread systemic autoimmunological process linking both diabetes mellitus and Parkinson's disease, with the ageing process will be discussed.

P24.

Essential Tremor and Parkinsonism Overlap

A.H. RAJPUT and B. ROZDILSKY (Saskatoon, Saskatchewan)

Tremor is a prominant manifestation in both the essential tremor (ET) and Parkinson syndrome (PS). Essential tremor is dominantly inherited and carries a favourable prognosis. Idiopathic (Lewy body) Parkinson's disease (IPD) is the largest single entity responsible for Parkinson syndrome. The extent of the overlap of IPD in ET is now a source of major debate to understand the etiology of IPD and the prognosis in ET.

Because IPD is more disabling than the ET, excessive risk of IPD would result in an unfavourable prognosis for the ET cases. The recognition of concurrent ET and IPD is difficult on clinical evaluation as

some ET cases also have parkinson like rest tremor. We are reporting our clinical and pathological findings in 5 (3F, 2M) ET cases assessed during last 22 years to address these issues.

An additional diagnosis of PS was made in 2 (40%) of these 5 cases — one patient had been taking neuroleptic drugs but the other one had no identifiable cause.

Grossly the brain was normal in all cases. There were no cerebral, basal ganglia, substantia nigra, brainstem or cerebellar histological abnormalities in those cases that had ET alone and in the drug induced PS case. In the second PS case, a remarkable basal ganglia status cribrosus was noted. The substantia nigra was normal in all cases.

An independent lower limb tremor was the most characteristic clinical feature where PS and ET coexisted. We do not find an exaggerated risk of IPD in ET cases.

Details including video tapes will be presented.

P25.

Remoxipride in the Management of Drug Induced Hallucinations in Advanced Parkinson's Disease

D.A. GRIMES, T. MENDIS, J.D. GRIMES, E. MOHR and Y. LAPIERRE (Ottawa, Ontario)

Drug induced hallucinations are a frequent and disabling problem in advanced Parkinson's disease and are often treatment limiting. Standard neuroleptics may be effective but worsen parkinsonism. Five patients (ages 54 to 86), with Parkinson's disease of 3 to 22 years duration, had developed hallucinations. The hallucinations were visual, were sometimes accompanied by delusional perceptions, and were present during the day but were more frequent at night. All the patients were receiving and continued long-term levodopa therapy. In addition, three patients continued long-term dopamine agonist therapy.

Remoxipride is a substituted benzamide compound which is a dopamine D-2 receptor antagonist. The drug has selective mesolimbic activity.

These patients were treated with Remoxipride in doses varying from 10 mg to 30 mg per day. Hallucinations and thought disorder improved in all patients and cleared completely in two patients and did not recur on stopping Remoxipride. Parkinsonism was not worsened in any patient.

Remoxipride may be a useful drug in the management of hallucinations in patients with advanced Parkinson's disease. Further studies are indicated.

Clinical Neurophysiology

P26.

Bulbo-Palmar and Bulbo-Plantar Sympathetic Evoked Potentials (BPSEPs) in Sexual Dysfunctions

M.L. LEBEL, L. THIBAULT and M. CARMEL (Sherbrooke, Quebec)

Sympathetic skin response is a quantitative technique for recording sympathetic nerve conduction in man. Successful recording of this response from the palm and sole has been recently described with electrical stimulation of the dorsal nerve of the penis (Park, 1988). This method was suggested to evaluate ejaculatory dysfunction. We have applied this test to a group of 15 patients with sexual dysfunction (erectile and/or ejaculatory). A mapping study of the Bulbo-Palmar and Bulbo-Plantar Sympathetic Evoked Potentials (BPSEPs) over various areas of the palm and of the sole was performed with a 16-channel EEG machine.

We have observed that: 1 — These potentials are relatively easy to obtain, provided appropriate filter selection is respected. 2 — Their amplitude, latency, and morphology vary slightly, but significantly, from test to test, and considerably from one area to the other, over the palm and sole in the same patient. 3 — Absence of ejaculation of neurogenic origin is best correlated with absence of the BPSEPs, instead of changes of latencies or amplitudes. 4 — BPSEPs remain normal in retrograde ejaculation associated with a very distal neurogenic lesion, and with erectile neurogenic dysfunction (which is best correlated with abnormal electrical bulbocavernosus responses).

P27.

EMG Estimation of Prognosis in Bell's Palsy

R.Z. KERN, G. ISRAELIAN and A. ALEX (Mississauga, Ontario)

Twenty-nine patients with Bell's palsy were studied with facial nerve motor conduction studies approximately 14 days after the onset of clinical weakness. Analysis of the orbicularis oculi compound motor action potential (CMAP) revealed the following: negative peak amplitude (affected 0.64 ± 0.48 mv; unaffected 1.50 ± 0.67 mv; $p < 0.0001$); latency (affected 3.86 ± 0.62 msec; unaffected 3.36 ± 0.42 msec; $p < 0.01$); and % loss amplitude ([unaffected-affected]/unaffected x 100%; $58 \pm 20\%$). Electromyography was performed on the affected frontalis muscle with a concentric needle electrode in 18 patients.

Twenty patients were followed for 9-12 months. Treatment, age, or sex did not influence the time to recovery. An amplitude loss of >70% correlated with a mean recovery time of 26.7 ± 8.3 weeks (vs all others 9.9 ± 9.9 weeks, $p = 0.026$) and identified 3/5 patients whose recovery time exceeded 24 weeks. The other 2 patients whose recovery was prolonged showed an amplitude loss between 60-70% in addition to signs of denervation in the affected frontalis muscle. Only 2 patients had an incomplete recovery with no further improvement after 12 months. Both showed an amplitude loss of >70%, while only one showed signs of denervation in the affected frontalis muscle.

Facial nerve motor conduction studies appear to assist in estimating prognosis in patients with Bell's palsy. A reduction in the affected orbicularis oculi CMAP to less than 70% of the unaffected side identified most patients whose recovery was prolonged or incomplete.

P28.

Evoked Potentials to Shifts in the Lateralization of a Sound: Results in Patients with Multiple Sclerosis

T. PICTON, L. MCEVOY, S. CHAMPAGNE, B. WEINSHENKER and R. NELSON (Ottawa, Ontario)

If an identical noise is presented to each ear with one ear receiving the noise slightly earlier than the other, the listener perceives the sound as originating from the side of the leading ear. If the interaural time-difference reverses, the subject perceives a shift in the lateralization of the sounds to the other ear. This shift in lateralization evokes a late auditory evoked potential with a negative wave at 145 ms and a positive wave at 220 ms (approximately 40 ms later than the normal response to the onset of a sound). This lateralization-evoked-potential specifically evaluates central auditory processing since information about the timing of the auditory stimuli must be compared between the two ears. The response should therefore be sensitive to disorders that affect the conduction velocity of central auditory neurons. Preliminary studies in ten patients with definite Multiple Sclerosis have shown that the response is abnormally late and/or small in six. The response may therefore be helpful in the clinical evaluation of patients with possible Multiple Sclerosis.

P29.

A Standardized Measure of the Cortical Motor Evoked Potential Amplitude for Assessing Central Axonal or Neuronal Loss

A.A. EISEN and S. SIEJKA (Vancouver, British Columbia)

Central motor neuronal or axonal loss is likely to be reflected by an amplitude reduction of the motor evoked potential (MEP). When these

pathological changes arise MEP latency and central motor conduction time are often normal even in the face of obvious clinical central motor disease. However, the normal variability of the MEP amplitude is considerable and has discouraged use of this characteristic.

We determined that by recording 10 sequential MEPs, elicited by random stimuli given once every 2-3 secs with the target muscle contracting at 15% maximum force, a large response was invariably elicited. Its inter- and intraindividual variability was small and allowed comparative measurement of MEP amplitude. Age significantly reduced MEP amplitude in parallel with the CMAP. In young subjects the largest thenar MEP measured 10.7 ± 2.2 mV (N = 12, mean age 29 ± 5.6 yrs). In middle aged subjects (N = 25, mean age 48 ± 4.9 yrs) it measured 8.0 ± 2.0 mV and in the elderly (N = 10, mean age 73 ± 4.3 yrs) it measured 6.1 ± 2.9 mV.

Within the 10 responses the largest response although occurring randomly did so with a frequency of 62.5% once, 29.6% twice and 4.6% three times. In several subjects we recorded 20 sequential responses. The largest was recorded 98% of times within the first 10 of these. The occurrence of large amplitude MEPs is reminiscent of randomly occurring large F waves. Both are probably subcortically (spinal cord) dependent.

Preliminary data suggest that MEP amplitude is a sensitive measure of central motor involvement in degenerative neurological disease in which MEP latency is usually normal.

P30.

Suppression of Motor Evoked Potentials by Inhalation Anesthetics

S. HAGHIGHI, R. MADSEN, K.D. GREEN, J.J. ORO and G. KRACKE (Columbia, Missouri)

Evoked action potentials from forearm muscles were recorded in response to single-shock supramaximal electrical stimulation of motor cortex in room air and under different concentrations (0.5%-1.5%) of isoflurane, enflurane, and halothane anesthesia in rats. Anesthesia was induced with a mixture of fentanyl and droperidol which was then followed by ten minutes inhalation of each gas anesthetic under controlled ventilation. In one group (n = 12), the effect of isoflurane was examined. With increasing concentrations of isoflurane there was a progressive increase in onset latency and a decrease in peak-to-peak amplitude and duration. A similar increase in the latency with a decrease in the amplitude and duration were noticed in animals under enflurane (n = 10) and halothane (n = 10) anesthesia. Inhalation of the three anesthetics caused a significant latency change over baseline (room air) values for concentrations starting from 0.5% to 1.5% (P-values were 0.001 to 0.011). For the amplitude and the duration, muscle responses under the volatile anesthetics at 0.5% to 1.5% concentrations were significantly lower than baseline (P-values were 0.001 to 0.011) for isoflurane, enflurane, and halothane anesthesia.

We conclude that isoflurane, enflurane, and halothane anesthesia significantly alter the muscle response evoked by motor cortex stimulation in experimental animals.

P31.

Effect of Ischemic Hypoxia on Cortical and Spinal Somatosensory Evoked Potentials in Rats

S.H. HAGHIGHI, S. GIBBS and J.J. ORO (Columbia, Missouri)

Under pentobarbital anesthesia and controlled room air ventilation, cortical and spinal somatosensory evoked potentials (CSEP, SSEP) were recorded in rats. CSEP (n = 10) and SSEP (n = 6) were recorded from exposed cortex and lumbar spinal cord, respectively, to stimulation of posterior tibial nerve. Following baseline recordings in room air (21% 02), all animals were subjected to a graded hypoxia at 15.75% and 10.5% oxygen levels for ten minutes. The baseline N1 peak latencies and N1-P1 amplitudes were 14.9 ± 2.3 msec, 4.8 ± 0.4 msec and 33.1 ± 29μV, 30 ± 17μV for the CSEP and SSEP, respectively. At a moderate hypoxia level (15.75% 02), N1 latencies were 15.2 ± 2.4 msec for the CSEP and 4.8 ± 0.4 msec for the SSEP which were not significantly different compared to baseline (P > 0.01). The N1-P1 amplitude was 40.1 ± 46μV (n = 9) for the CSEP and 30 ± 17μV (n = 6) for the SSEP. At 15.75% hypoxia, change in the amplitude of SSEP was not significant compared with the room air (P > 0.01). However, CSEP amplitude showed a trend toward increase at this hypoxia level. One animal lost CSEP at 15.75% level. At severe hypoxia (10.5% 02), eight out of 10 animals lost CSEP within two minutes. SSEP was resistant to 10.5% hypoxia and was present in all animals with the N1 peak latency of 4.8 ± 0.4 msec and N1-P1 peak amplitudes of 31.6 ± 21μV which were not significantly different from the baseline values. We concluded that hypoxia affects CSEP with tendency to increase the amplitude at moderate hypoxia (15.75% 02) and loss of amplitude with severe hypoxia (10.5% 02).

E. Neurosurgery

P32.

Nervus Intermedius Section for Chronic Cluster Headache: Operation, Intraoperative Monitoring, Efficacy, and Observations on Pathogenesis

D.W. ROWED (Toronto, Ontario)

Nervus Intermedius (NI) section has been infrequently performed for long term relief of chronic cluster headache (CH).

Efficacy may depend on interruption of efferent parasympathetic impulses responsible for the autonomic concomitants of CH and perhaps, secondarily, pain and/or of afferent nociceptive fibres which are known to be present in the NI.

Our experience with NI section, combined with microvascular decompression of the trigeminal nerve when indicated, with intraoperative eighth nerve action potential (AP) monitoring, suggests that the procedure is simple, effective, and safe.

At the time of reporting, 6 patients suffering from chronic daily CH have been subjected to NI section via a lateral suboccipital approach. Follow-up varies from 2 to 22 months (mean 11.3). All experienced immediate relief from daily headache, though 5 of 6 have had delayed recurrence of headache of lesser severity. Four of 6 patients are completely free of headache currently, and all are improved.

Five of 6 patients have experienced moderately severe but transient vertigo, and 2 have sustained ipsilateral sensorineural hearing loss.

Branches of the anterior inferior cerebellar artery (AICA) were found in intimate contact with the NI in 4 patients. This intimate relationship does not necessarily imply causation, but has not been seen in our much larger series of vestibular nerve sections.

NI section may be an effective means of relieving chronic cluster headache, if a low complication rate can be maintained. Follow-up is not yet adequate to assess long term benefit. Vascular compression may play a role in the pathogenesis of some cases of chronic CH.

P33.

Fractured Occipital Condyle Producing a Twelfth Nerve Palsy

O.N.R. DOLD (Calgary, Alberta)

A 59-year-old man rolled his motor vehicle on February 1, 1987 sustaining a minor head injury, chest and limb injuries. There was a laceration with bruising of the scalp over the vertex.

Neurological examination revealed a left sixth nerve paresis and a complete right twelfth nerve palsy. CT scanning revealed a bony mass in the foramen magnum. Tomograms revealed a fracture with displacement of the right occipital condyle. He was treated with a rigid cervical collar for three months.

The follow-up CT scanning revealed no further displacement of the fracture fragments. Two years later the twelfth nerve palsy remains as his only neurological deficit. Occipital condyle fractures are extremely

rare. Fifteen cases have been previously reported in the literature. These have not been usually associated with neurological deficits. In this case the fracture occurred most likely as a result of axial loading to the vertex of the skull. The fracture likely extended into the hypoglossal canal injuring the twelfth cranial nerve.

P34.

Spinal Accessory Nerve Palsy Following Carotid Endarterectomy

P.J. SWEENEY and A.J. WILBOURN (Cleveland, U.S.A.)

A remarkable variety of cranial nerve injuries, incurred at the time of carotid endarterectomy, have been reported. The most frequently mentioned are: A) the 7th cranial nerve (marginal mandibular branch), B) the X Cranial Nerve (superior and recurrent largyngeal branches) and the C) XII Cranial Nerve.

We now report on two cases of Spinal Accessory Nerve Palsy following carotid endarterectomy at our institution. These comprise 10% of all the isolated Spinal Accessory nerve palsies seen in our EMG laboratory.

The proposed mechanisms of these different complications will be reviewed with special emphasis on the posited etiology for the Spinal Accessory Nerve palsies.

P35.

Fractionated Postcraniotomy Light Delivery for Photodynamic Therapy of Malignant Brain Tumours

PAUL J. MULLER and BRIAN C. WILSON (Toronto; Hamilton, *Ontario*)

We have treated 56 patients with malignant brain tumours with intraoperative photodynamic therapy [PDT] using an argon dye pump laser and pre-operatively administered hematoporphyrin derivative or dihematoporphyrin ether. In 8 cases, in addition to cavitary photo-illumination, we have used cylindrical diffusion fibers to increase the amount of light energy administered to the tumour tissue intra-operatively. This interstitial photo-illumination was tolerated at light energy densities of less than 450 J/cm.

In our two most recent cases, both of whom had large bifrontal malignant gliomas that crossed the midline in the corpus callosum and could not be illuminated adequately at a single session, cylindrical diffusion fibers were left in situ after intraoperative cavitary photoillumination of the tumour residuum.

The fibers were protected from fracturing by placing all but the exposed diffusing end in a red rubber catheter of the appropriate diameter. The fibers were externalized through a separate stab wound as would be the case for ventricular drain. Photo-illumination was continued one or two days post-operatively. The optimal fiber couple to the argon dye pump laser was achieved by assessing the fiber side scatter with a photometer.

The two patients received 3825 and 2475 Joules by intraoperative cavitary photo-illumination, respectively, for an energy density of 83 and 54 J/cm^2. The post-operative photo-illumination session resulted in the interstitial administration of 293 and 450 J/cm, respectively. The patient tolerated the fractionated photo-illumination well. A transient scalp inflammation occurred as the consequence of light transmission to skin from the implanted fibers.

P36.

Echocardiographic Detection of Intracardiac Thrombi Complicating Ventriculo-Atrial Shunt: Report of two cases

D. LADOUCEUR and M. GIROUX (Sherbrooke, Quebec)

Right atrial thrombi are rare but serious complications of ventriculo-atrial (VA) shunts. Two hydro-cephalic patients treated with a ventriculo-atrial shunt developed thrombo-embolic complications.

The clinical presentations were malfunction of the distal end of the shunt and right heart failure.

Bidimensional echocardiography demonstrated an intra-cardiac mass on the distal intra-auricular end of the shunt. Pulmonary scan showed multiple emboli even in the asymptomatic patient.

This demonstrates the important role of bidimensional echocardiography as a non-invasive diagnostic technique for this particular complication of VA shunt.

Medical and surgical treatment modalities are discussed.

P37.

Traumatic Sciatic Neuropathy

D. LADOUCEUR, D. YOUNGE, M. LEBEL and D. BERGERON (Sherbrooke, Quebec)

The sciatic nerve is vulnerable to an entrapment neuropathy as it crosses the sciatic notch in leaving the pelvis. Traumatic sciatic nerve entrapment at the greater sciatic notch has been documented previously. The implication of the pisiformis muscle as a compressive factor has been proposed in certain cases.

A case of intractable sciatica following a fall in the sitting position is reported. Investigations were negative for a lower lumbar compressive radiculopathy. Somatosensory evoked potentials of tibial nerves revealed a prolonged latency between the popliteal and lumbar regions on the symptomatic side. Tomodensitometric studies of the pelvis showed an hypotrophic sciatic nerve and piriformis muscle. Diagnostic injection of local anesthetics relieved the pain temporarily. Following a surgical decompression of the sciatic nerve at the piriformis level, the pain disappeared. Multiple fibrous bands were observed at surgery, but no compression from the piriformis muscle itself was noted.

P38.

Intraneural Cyst of the Common Peroneal Nerve

D. LADOUCEUR, D. YOUNGE, J.G. VILLEMURE, C. LUNEAU and M. LEBEL (Sherbrooke, Quebec)

Intraneural cyst is a rare lesion, and its etiology is controversial. Three patients presenting a drop foot and a tender mass at the proximal tibiofibular joint following a moderate trauma are reported: Electrophysiological and tomodensitometric studies were compatible with a common peroneal nerve (CPN) lesion at the proximal tibiofibular joint level. Surgical exploration revealed a multiloculated mass continuous with the CPN. A ganglion sac containing gelatinous material was evacuated. In two patients the articular branch of the CPN was identified and removed. Recurrence of the cyst and drop foot persisted in the patient where no articular branch was identified.

There was a history of trauma in all three cases.

Clinical and electrophysiological improvement followed surgical treatment.

Identification and section of the articular branch of the CPN seems to be necessary to prevent recurrence of the intraneural cyst.

P39.

The Radial Tunnel Syndrome

D. YOUNGE and D. LADOUCEUR (Sherbrooke, Quebec)

This syndrome consists of post-exertional pain in the forearm extensor muscles caused by compression of the posterior interosseus nerve (PIN). The authors treated 20 patients with 23 nerves compressed with an average delay before diagnosis of 20 months. Six had previous surgery for tennis elbow without relief. The history was usually typical with complaints of pain in the dorsal forearm extensor muscles, worse during or after effort. The most useful sign was local tenderness on pal-

pation of the PIN between brachioradialis and the radial wrist extensors, plus pain with resisted supination or pronation. EMGs were done in eleven of the most symptomatic cases and only showed abnormalities in the one case where clinical paresis was evident. The most frequent site of compression was the arcade of Frohse or the supinator muscle belly itself, with other causes being fibrous bands, the fibrous edge of ECRB, and the recurrent radial vessels. Two unusual causes in this series were a ganglion cyst and a schwannoma. In four cases there was no evident cause. Follow-up was an average of 15 months, with a minimum of six months. Results were good or excellent in 70% of the cases. The reason for the fair and poor results is not clear. The authors feel that this syndrome has not received the attention it deserves and that most cases are not diagnosed.

P40.

Neuropathie Cubitale Sensitive Interdigitale du Coiffeur

L. THIBAULT, M.L. LEBEL and D. YOUNGE (Sherbrooke, Québec)

Un coiffeur de 45 ans présenta en 1980 des engourdissements du 4e et 5e doigts de la main droite pour lesquels il fut opéré au niveau du canal de Guyon. Après un arrêt de travail de quelques semaines, les engourdissements s'estompèrent, puis finirent par disparaître.

En 1989, il consulta pour des engourdissements similaires, continuels, localisés très précisément dans le territoire de la branche interdigitale du nerf cubital. L'examen neurologique révélait une dysesthésie et une hypoesthésie tactile occupant l'aspect médial de l'annulaire, latéral de l'auriculaire, et épargnant l'aspect médial de ce dernier. On notait une callosité palmaire localisée 3 cm distale au canal de Guyon, et entraînant un signe de Tinel à sa percussion.

Nous avons pu constater que 5 des instruments de coiffure utilisés quotidiennement pouvaient exercer une pression itérative au site de la callosité observée. L'évolution a été favorable après une cessation d'activités de 3 mois et une reprise graduelle du travail avec une orthèse protectrice de la paume.

Ce cas intéressant nous illustre 2 particularités des neuropathies chroniques "occupationnelles":

1. Une callosité à un site donné peut localiser le siège d'un traumatisme répété.
2. Toute atteinte d'un territoire nerveux inhabituel constitue un signe de suspicion.

Neuro-Imaging/Neuropsychology

P41.

Subarachnoid Hemorrhage Associated with a Normal Head CT: Bayesian Analysis

R.G. AUGER and M.D. SILVERSTEIN (Rochester, U.S.A.)

The head CT can be negative in patients who have an otherwise typical subarachnoid hemorrhage. In this study, Bayes' formula is used to calculate the probability of an intracranial hemorrhage being present in spite of a negative CT scan. If the prior (pre-test) probability of subarachnoid hemorrhage is high and the CT is negative, the posterior (post-test) probability of having a hemorrhage will also be high even though the false negative rate is low. In estimating probability of disease after a test result, it is necessary to take into account the prior probability of disease as well as the sensitivity and specificity of the test being administered.

P42.

Magnetic Resonance Imaging in Neurocysticercosis

S. WIEBE, G.B. YOUNG, A. BUCHAN, D. LEE and L. ASSIS (London, Ontario)

The diagnosis of cysticercosis in nonendemic countries like Canada may be difficult. The clinical manifestations are protean, varying with the site(s) and stage of disease. Modern sero-diagnostic techniques are useful but are not readily available; more definitive proof that the lesions are cysticerci is usually desirable. We present two cases involving Mexican immigrants with central nervous system cysticercosis in whom the specific diagnosis was made with magnetic resonance imaging (MRI).

A forty-year-old woman presented with focal motor seizures and an ipsilateral hemiparesis. Computed tomography (CT) showed a ring enhancing lesion in the left frontal lobe.

A fifty-year-old man developed intermittent headache, diplopia and vomiting. Examination showed meningismus, nystagmus and oculomotor palsy. CT showed several ring enhancing lesions in cerebral hemispheres and midbrain.

In both cases MRI showed the lesions to be cysts containing a parasitic scolex, consistent with cysticercosis. In the second case additional lesions were found. The diagnosis of cysticercosis was subsequently supported by positive immunoblot assays on serum and cerebrospinal fluid. Neither case required surgery; both showed improvement on Praziquantel and corticosteroids.

P43.

MRI in the Diagnosis of Dominantly Inherited Cerebello-Olivary Atrophy (Holmes' Ataxia). A Clinicopathologic Study

A. ABDOLLAH, R. DEL CARPIO, Y. ROBITAILLE, F. ANDERMANN, E. ANDERMANN and D.L. ARNOLD (Montreal, Quebec)

To facilitate the study of cerebellar degenerations, improved clinical diagnosis is required. Cerebello-olivary atrophy (COA) is pathologically distinct, but precise diagnosis is thought to require postmortem examination (Greenfield's Neuropathology 1984). COA was considered in two patients (A, B) from two families with dominantly inherited ataxia. Affected members developed a stereotyped progressive "pure" cerebellar syndrome beginning with gait ataxia followed years later by dysarthria and limb ataxia. Pathologic examination of patient A's father revealed paleocerebellar and inferior olivary atrophy, characteristic of COA. Brain MRI (1.5 Tesla) of patients A and B revealed much greater atrophy of the vermis than the cerebellar hemispheres; atrophy of the medulla but a normal pons. Clinical diagnosis of dominantly inherited COA (Holmes' Ataxia) was thus made in patients A and B, with pathologic confirmation in the first family.

This study demonstrates that a characteristic clinical and MRI picture permits a confident clinical diagnosis of dominantly inherited COA (Holmes' Ataxia). Recognition of this entity during life should advance the nosology of cerebellar degenerations.

P44.

Meningitic *Listeria* Rhombencephalitis with MRI Findings

F.J. TYNDEL and D.B. ROSE (Toronto, Ontario)

A fifty-year-old man was admitted to hospital with a one week history of headache, fever and cough. He was in ventilatory failure and required intubation and ventilation. On examination, temperature was 39°C, neck stiff and sensorium normal. There was elevated protein and pleocytosis with lymphocyte predominance in the CSF. CSF and blood cultures grew *Listeria monocytogenes*. CF for Listeriosis was negative. There was no clinical or laboratory evidence of immunocompromise. The next day he developed diplopia, left horizontal gaze paresis, diminished left corneal reflex, left LMN facial palsy and subtle right corticospinal tract signs. Video-fluoroscopic study showed delayed swallowing reflex and reduced laryngeal elevation, epiglottal closure and pharyngeal peristalsis. IV ampicillin was administered. He required tracheostomy for three weeks and naso-gastric feeding for four weeks. The neurologic signs resolved with the exception of mild dysphagia at one year.

MR scan showed a 3 × 5 mm slit-like lesion in the left pons 5 mm cephalad to the level of the internal auditory canals.

The MRI findings of Listeria rhombencephalitis have to date been infrequently reported. They will be shown for this case and the literature will be reviewed. A hypothesis for the pontomedullary localization of CNS Listeriosis will be proposed.

P45.

The Sensitivity of Utilization Behaviour, Imitation Behaviour and the Environmental Dependency Syndrome in the Diagnosis of Frontal Lobe Lesion — Two Illustrated Cases as Depicted in Video

M. HOFFMAN and D. ADAMS (St. John's, Newfoundland)

A Prospective Trial designed by our General Neurology Service entered all patients with clinical, confirmed by computerized tomography evidence, of frontal lobe lesions.

Over a four month period, six patients were seen with unilateral or bilateral frontal lobe lesions. Two patients demonstrated signs of Utilization Behaviour, Imitation Behaviour and one the Environmental Dependency Syndrome.

These newly appreciated frontal lobe signs may be amongst the earliest and most sensitive signs. We present data from a small group to give some idea as to the prevalence in frontal lesions and demonstrate these signs audiovisually.

P46.

Localization of Lesions in Peripersonal Neglect

P.A. SHELTON and K.M. HEILMAN (Winnipeg, Manitoba; Gainesville, U.S.A.)

Neglect is a complex disorder of behaviour resulting from deficits in attentional processes. Hemispatial neglect occurs in association with a variety of focal lesions in either cerebral hemisphere. Altitudinal and peripersonal neglect have been described in individuals with bilateral parietal and temporal lobe lesions.

In this study, spatial attention was assessed in 10 subjects with acute focal cerebral infarctions and typical hemispatial neglect. Lesions were typical of those causing hemispatial neglect, most often frontocentral and inferior parietal. In a visual line bisection task, subjects erred toward near peripersonal space (mean -0.37 ± 1.2 cm) compared to 12 control subjects (2-sample t-test, $p < 0.02$). In a tactual line bisection task, subjects again erred toward near space (mean –1.2 ± 1.3 cm) compared to controls ($p < 0.05$) suggesting multimodal neglect of far peripersonal space. No difference in bisection performance was demonstrated between the left and the right hemisphere damaged groups (5 left, 5 right).

These findings indicate that neglect of far space is characteristic of the neglect syndrome in general. Furthermore, the results suggest either that diverse regions of both hemispheres mediate attention to near and far space, or, that any lesion affecting global attentional capacity results in preferential attention to near space.

General Neurology

P47.

Sciatic Neuropathies: A 10 Year Experience

W. JOHNSTON and J.D. STEWART (Montreal, Quebec)

Sixty-two patients with 68 sciatic neuropathies (6 bilateral) are reviewed.

CAUSES: Fractures of pelvis and/or femur — 31%; hip surgery — 25%; external compression (prolonged coma — head injury, drugs, prolonged anaesthesia) —21%; injection — 8%; direct nerve injury — 6%; miscellaneous — 10%: post-hip surgery, hematomas, schwannomas, endometriosis and mononeuritis multiplex.

NEUROLOGICAL DEFICITS: The sciatic nerve consists of the lateral and medial trunks. Lesions of the former mimic peroneal palsies. Involvement of these trunks were: Predominantly lateral — 57%; predominantly medial — 9%; both — 34%. Careful clinical examination revealing subtle involvement of the medial trunk allowed predominantly lateral trunk sciatic neuropathies to be distinguished from peroneal palsies. In 4 patients this distinction could only be made by electrophysiological studies.

External compressive sciatic neuropathies were usually severe (78%). In the post-hip surgery group, severe deficit was less common (22%).

P48.

Autonomic Neuropathy in Alcoholics is not Related to Hepatic Injury

J.A. COHEN, W. RECTOR, F. HARRIS and J. CAIN (Denver, U.S.A.)

Autonomic neuropathy (AN) occurs in Alcoholics. It is thought to be related to small fiber peripheral nerve pathology. The etiology of peripheral neuropathy in Alcoholics is unclear, nutritional status, toxic effects, and hepatic injury are implicated. We reviewed ANS function in 3 groups of subjects: Normals (N), Alcoholics without Liver Disease (A) and Alcoholics with Liver Disease (AL). In the Alcoholics with Liver Disease (AL) we examined the relationship of the severity of the AN to the severity of hepatic injury as assessed by caffeine, antipyrine, and cholate clearance studies.

RESULTS OF ANS TESTING

GP	VM	HR BD bpm	QSART (hd)	QSART (ft)
N	1.80 ± 0.26	20.60 ± 4.20	1.00 ± 0.00	1.00 ± 0.00
A	1.52 ± 0.29	10.08 ± 7.3	0.40 ± 0.52	0.60 ± 0.52
AL	1.49 ± 0.24	12.5 ± 7.8	0.38 ± 0.50	0.49 ± 0.49

Compared to Normals, Alcoholic subjects with and without hepatic damage have blunted HR responses to VM ($p < .001$) and DB ($p < .001$). QSART was significantly impaired in the hands ($p < .05$) and feet ($p < .05$). No statistical relationship existed between the presence or severity of hepatic injury to the severity of AN.

We conclude that AN in Alcoholics is not related to the presence of hepatic injury.

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P49.

Antiphospholipid Antibody Syndrome Presenting with Chorea Gravidarum, Amaurosis Fugax and Mitral Regurgitation

R.T. SEMMLER, D.C. HOWSE, M.F. MATANGI and I.L. DWOSH (Kingston, Ontario)

Antiphospholipid antibodies (APLAb) have been reported in association with chorea gravidarum and amaurosis fugax. Recent reports also implicate APLAb as a possible etiology of cardiac valvular disease.

We report an 18-year-old woman who presented to the Neurology service 8 weeks into her second pregnancy with 4 episodes of amaurosis fugax and the onset of choreiform movements predominantly on her left side. There was no previous history compatible with acute Rheumatic Fever. Her CT was normal and angiodynography was negative. Echocardiogram revealed severe mitral regurgitation that was not previously documented. Her ANA was negative. IgM anti-cardiolipin antibodies were strongly positive.

We propose that her constellation of findings could be explained by an Antiphospholipid Antibody Syndrome. This is the first reported case of cardiac valvular disease in association with chorea gravidarum and antiphospholipid antibodies.

P50.

Antiphospholipid Syndrome: Central Arterial Vasculopathy and Demyelinating Disease

C.L. VOLL, L. ANG and J. DONAT (Saskatoon, Saskatchewan)

To date, there have been few reports concerning the neuropathological correlates of the antiphospholipid syndrome (APLS). We present the clinical and neuropathological autopsy findings in a 52-year-old female patient with demyelinating disease, and recurrent strokes occurring in association with APLS, who died following intraoperative cardiac arrest. Examination of medium and small arteries in the brain demonstrated a focal endoproliferative inflammatory vasculopathy, which was seen only in regions of recent and old brain infarction. The vasculopathy is similar to that previously described in small and medium sized peripheral arteries in APLS. A non-inflammatory vasculopathy, affecting small arteries, most likely secondary to bland arterial thrombosis with recanalization was also seen in separate regions of brain infarction. This is the *first demonstration* of a central inflammatory arteriopathy in association with APLS, and may represent one of the mechanisms leading to recurrent cerebral ischemic episodes in APLS. Multiple demyelinative plaques were scattered through the cerebral hemispheres, brainstem, cerebellum and spinal cord. Although the concurrence of antiphospholipid antibodies and demyelinating disease may have been a chance association, the probability of chance concurrence of the two conditions is extremely low. Previous reports have documented an association between demyelinating disease and antiphospholipid antibodies occurring in association with systemic lupus erythematosus (SLE), however an association between demyelinating disease and the APLS, in the absence of other features of SLE, has not been previously reported.

P51.

Guillain-Barré Polyneuritis Associated with a Chloroquine Resistant Plasmodium Falciparum Malaria

M. THIBAULT, D. BRUNET, S. CLAVEAU, G. PATRY and J.-P. BOUCHARD (Ste-Foy; Quebec City, Quebec)

Neurological complications of malaria are still poorly understood and include mostly central nervous system involvement, with brain edema, encephalitis and convulsions. A few cases of malaria accompanied by polyneuritis without CNS involvement have been described recently in India and Brazil; three of the five reported cases were fatal.

We report the first observation in the literature of an acute ascending motor polyneuritis occurring in a patient with a chloroquine-resistant *P. falciparum* malaria. This Canadian patient had been living in the western part of Zaïre for more than a year while taking chloroquine prophilaxis. When treated for this condition in Quebec City, he first complained of numbness in the four extremities, and soon after of unstable gait and ascending weakness. Clinical (moderate diffuse weakness and absent DTR), electrophysiological (EMG and NCS) and laboratory findings (CSF protein: 175 mg/100 ml) were consistent with the Guillain-Barré syndrome. HIV serology was negative in the serum and in the spinal fluid. The weakness progression stopped without treatment and the patient was symptoms free after three months.

An immune mechanism most likely explains the demyelination in malaria associated polyneuritis. The different stages of the parasite represent many antigenic targets that can induce a large variety of mixed humoral and cellular immune responses. In this case a toxic reaction to chloroquine is unlikely.

P52.

Cerebral Hemorrhage in Syphilitic Arteritis

R. DESBIENS, C. ROBERGE, R. LANGELIER, M. HEBERT and G. RACINE (Quebec City, Quebec)

Cerebral vasculitis is a well known manifestation of syphilis. Clinical and angiographic findings have been frequently reported in this condition. We observed a case of vascular syphilis evolving over a thirty year period, and presenting with cerebral hemorrhage and Moya-Moya features.

This forty-nine-year-old woman was affected by congenital syphilis. Syphilitic arteritis was diagnosed in 1961 (age 20), after a mild stroke, on the basis of positive serologic, CSF and angiographic findings. She was treated with penicillin and was well and active until 1989 when she was admitted for sudden headache and ataxia. A stiff neck was found and CT scan showed a small hemorrhage in the cerebellar vermis, with blood in the ventricular system. On admission, an angiogram showed diffuse arteritis and total occlusion of right carotid and basilar arteries at the base of the skull. A rich collateral circulation of Moya-Moya type was seen. Clinically, the patient remained conscious throughout her illness and was left with mild ataxia.

This is one of the most severe cases of syphilitic arteritis reported in the recent literature, and the only one to our knowledge which has been complicated by cerebral hemorrhage. No aneurysm or AV malformation was demonstrated, and we postulate a tear in the wall of an involved vessel as the cause of bleeding.

P53.

Pseudotumor Cerebri: Incidence and Seven Years Follow Up Study in Qatari Patients

B. MESRAOUA, SALAH KHADDASH and AHMED HAMAD (Doha, Qatar)

Fourty-four cases of pseudotumor cerebri were treated between 01 January 1983 and 31 December 1989 at Hamad General Hospital, the only referring hospital in Qatar, a small peninsula in the east coast of Saudi Arabia with a population of 370,000 people of whom approximately 90,000 are native Qatari. 27 patients were Qatari and were followed from 2 weeks to 7 years. Their mean age is 23.8 years (range from 9 to 35 years) with a peak in the third decade (67%). The M/F ratio is 1/26. The average incidence in the general population is 3.96/100,000 with a relatively high incidence in spring (33%). 62% were above ideal weight. All had bilateral papilloedema which was asymmetric in one patient. CT head was performed in 26 patients with small ventricular system in 6 at initial presentation and persisting small ventricular volume in 2 at review. Visual evoked responses were studied serially in 13 patients and were abnormal in 7. 11 patients (40%) had a recurrence 2 months to 30 months after the first onset. At follow up 2 patients developed bilateral optic atrophy and blindness and 3 patients were left with moderate to severe visual loss. To date, chronic papilloedema is still present in 12 patients. Our study demonstrates that pseudotumor cerebri is a disorder with a distinct predilection for women with a higher incidence in Qatari patients compared to the others available studies. This figure should be much higher for the female population. The rate of recurrence is also unusual and will be compared to the other series. Chronic papilloedema might constitute a threat of permanent visual loss and therefore prolonged follow up with serial visual fields, acuity and evoked potentials is imperative. Altered fluid balance due to extreme weather conditions in Qatar may be partly responsible for disturbed CSF in pseudotumor cerebri explaining the high incidence of this disorder in this part of the World.

P54.

Autosomal Recessive Motor Neuron Disease and Dementia (ARMND) in a French Canadian Family

L.A. CARMANT and J.P. BERNIER (Sherbrooke, Quebec)

Patients with ARMND were described by Hoffman, Cross et al and Staal. These cases have been classified as hereditary M.N.D., spastic ataxias or complicated spastic paraplegia. This study reports a french Canadian family with ARMND to clarify its characteristics. Six siblings are affected out of 14, 5 males and 1 female, products of non consan-

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guinous normal parents. Onset was between 10-15 years of age with spastic gait, dysarthria and school difficulties. This progressively led to generalized muscle weakness and dementia. Additional findings included slight ataxia, emotional lability and pseudo-athetosis without sensory deficit. All were wheelchair bound before age 30. The oldest and youngest were thoroughly investigated. The EEG disclosed similar paroxysmal bursts of generalized slow wave activity. CT showed cerebral and cerebellar atrophy. Needle EMG and muscle biopsies exhibited chronic distal and proximal denervation. All abnormalities were more conspicuous in the older brother. Multimodal evoked potentials, nerve conduction studies, sural nerve biopsy and biochemical investigation including hexosaminidase A-B were normal.

This syndrome shares feature with the Troyer, Charlevoix-Saguenay and ALS-dementia syndromes, but age of onset, rate of progression and predominant diffuse motor neuron involvement suggest an original expression of ARMND.

P55.

Multiple Sclerosis in Qatar

A. HAMAD and BOULENAR MESRAOUA (Doha, Qatar)

Qatar is a small peninsula in the east coast of Saudi Arabia, its latitude is 24°-27°N. Its population is 370,000 of whom approximately 90,000 are native Qataries. Hamad General Hospital is the only referral hospital in the country. By reviewing patients records since 1982 we identified 13 cases of Multiple Sclerosis. Six were native Qataries and the rest were immigrants. No Qatari case was detected before 1985. Five cases have clinically definite M.S. and one possible M.S. (POSER et al). Four cases have relapsing remitting type, their mean age of onset 20 years, the duration of illness 4-7 years, all had clinical involvement of visual, motor, sensory and cerebellar pathways. In follow-up one female had moderately severe cerebellar ataxia and one male had mild ataxia and lost vision in one eye. Two other males age 43 years presented with progressive type (paraparesis), duration of illness 3-5 years. In follow-up one confined to wheelchair, the other still ambulatory. Our data suggests a crude prevalence rate of 6.8/100,000 placing Qatar in the "Medium risk zone" as Kuwait and Saudi Arabia. Although Qataries and Saudies are from the same ethnic group we noticed marked difference in symptomatology. Their study suggests a M:F ratio of 3:13, visual loss in 19% and no case of progressive type. However such difference can partially be explained by the small number of our patients. Our data suggest an increasing incidence of M.S. as noted in Saudi Arabia. This could be partially explained by the rapid modernization of Qatar in the last 20 years leading to influx of immigrants from high risk zones and replacing the local traditional seafood by new dietary habits. Detailed neurological, neurophysiological, neuroradiological and biological studies will be presented.

FRIDAY, JUNE 29, 1990

Pediatric Neurology

P56.

Orbitofrontal Epilepsy in a Child

H. DESAI and R.S. MCLACHLAN (London, Ontario)

Although the diagnosis is often suspected, only a single case of well documented orbitofrontal epilepsy has previously been reported. We describe a second case in an eight-year-old, right-handed child with intractable complex partial seizures of unknown etiology since age four years. Seizures onset with a fearful sensation followed by loss of awareness, automatisms and tonic extension of the arms lasting 1-15 minutes occurring 1-20 times per day. He did not fall and had no grand mal seizures. Physical and mental examinations were normal. The initial diagnosis was temporal lobe epilepsy. Interictal EEGs revealed prominent right temporal frontal, right hemisphere and generalized spike waves but recorded seizures could not be localized. Telemetry with subdural electrode recordings over both temporal and frontal areas revealed an active spike focus in the right orbital frontal region with seizures originating in the same area. MRI was normal. A partial frontal lobectomy limited to the orbitofrontal region was carried out and moderate cortical dysplasia was found. He has remained seizure-free for two years. EEG telemetry with intracranial electrode recording is required to differentiate this rare disorder from temporal lobe epilepsy. The prognosis for seizure control following surgery in this condition is excellent compared to the less favourable prognosis in the more common patients with orbitofrontal abnormalities in combination with seizures from other parts of the frontal lobe or temporal lobe.

P57.

Intraoperative EMG In Selective Posterior Root Rhizotomy

H.Z. DARWISH, S.T. MYLES and M. HULLIGER (Calgary, Alberta)

In our program we have operated on eight children age ($\bar{x}$= 11.3 yrs ± 3.5), 3 of whom were ambulatory and 5 were not. Five were borderline or normal mentally, 2 were severely handicapped and one was mildly retarded. Six had had orthopedic procedures.

In 4, more than 60% of rootlets stimulated were sectioned (67.8 ± 2%) and in the other 4, less than 60% were sectioned ($\bar{x}$ = 43.5 ± 12%).

A high dorsal root: ventral root ratio of stimulus intensity was needed to elicit spasmogenic responses intraoperatively in the children who had exhibited a marked clinical startle response preoperatively. These were also the children who exhibited so called "bistable" or "on - off" responses.

Children who were mentally high functioning preoperatively seemed to show more homogenous response in their EMG to posterior root stimulation mainly of the incremental type. Children who were mentally handicapped seemed to show a wider variety of "spasmogenic responses" and diffusion to contralateral muscles.

These early intraoperative EMG results may suggest different mechanisms for spasticity in these children and may have correlation with the outcome of the procedure.

P58.

Spinal Cord Hemangioblastoma Associated with Syrinx and Hydrocephalus in an Eighteen Month Old Child

A. MOCK, DR. A. LEVI and DR. J.M. DRAKE (Toronto, Ontario)

Spinal cord hemangioblastoma, a tumor frequently associated with Von Hippel Lindau disease, is rarely found in childhood. Only 15% are found in the pediatric group with two reported cases before the age of three.

A case of a solitary spinal cord hemangioblastoma associated initially with syringomyelia, and subsequently with acute communicating hydrocephalus, in an eighteen month old child is presented.

The child presented with acute inability to weight-bear. Myelography and unenhanced Magnetic Resonance Imaging (MRI) demonstrated a large syrinx but failed to demonstrate the neoplasm. Acute communicating hydrocephalus developed requiring a ventriculoperitoneal shunt. The tumor was discovered fortuitously at surgery and excised. Collapse of the syrinx with complete recovery followed. Gadolinium enhanced MRI failed to demonstrate residual or other tumor.

Although syringes are commonly associated with hemangioblastomas of the spinal cord, hydrocephalus has never been reported with this tumor. Hydrocephalus in this case could have resulted from a variety of different mechanisms. The use of Gadolinium enhanced MRI will lead to better detection of these neoplasms.

P59.

Stereotypic Hand Movements after California Encephalitis: Video and EEG Evidence on the Pathophysiology of Rett Syndrome

S.R. MACKEN, D.L. MACGREGOR and J.E. WARK (Toronto, Ontario)

An 11-month-old boy with a normal birth and developmental history, acquired California virus encephalitis. At 12 months he developed focal and myoclonic seizures which were refractory to medical therapy. By 16 months he was noted to have deteriorated, with a one month history of loss of interest in toys, poor interaction with parents and the development of midline stereotypic hand-wringing movements. Associated with this he had a marked decline in purposeful hand use. He continued to have frequent focal and myoclonic seizures.

MRI showed increased signal intensity in the periventricular white matter, but no evidence of demyelination.

A video EEG shows a disturbance of background; in addition there are episodes of generalised paroxysmal fast activity followed by suppression of the record, associated with tonic seizure activity. There are paroxysmal patterns consisting of multifocal epileptiform sharp wave disturbances, as well as a pseudo-periodic pattern described as highly characteristic of Rett Syndrome by Hagne, Witt-Engerström and Hagberg (EEG Journal, 1989, 72: 1-6). The hand-wringing movements showed no EEG correlate, but rhythmic hand movements with the arms extended were observed to be time-locked to the active phases of the psuedo-periodic pattern.

The EEG is, with the exception of the psuedo-periodic pattern, not like those seen in early Rett Syndrome. However, the presence of the changes of hand function and one highly characteristic EEG feature, offer an exciting clue to the pathophysiology of the major early movement disorder aspect of Rett Syndrome. The correlation of hand movements and EEG changes adds to evidence from Robertson et al (EEG Journal, 1988, 70: 388-395), and a recent review of Rett Syndrome EEG's from our laboratory, submitted to this meeting.

P60.

Parent Stress and the Neurologically Impaired Child

E.J. THOMPSON, S. MARCOVITCH, D. MACGREGOR, S. GOLDBERG and E. MCKINNON (Toronto, Ontario)

Parents of handicapped children often report experiencing more stress than parents of nonhandicapped children. There is some evidence that having a handicapped child may affect families differentially. Thirty-seven children, aged birth to 18 months, who were about to enter a home-based early intervention program were followed over a six month period. Research visits took place immediately prior to participation in the program and after the first six months of intervention. Four groups of children were followed; 1) children with Down's Syndrome, 2) children with a diagnosed neurological disorder (e.g. cerebral palsy, seizure disorders), 3) children born prematurely with "high" risk for developmental delay, 4) children with developmental delays of unknown etiology. At each research visit parents completed the Parenting Stress Index (PSI). This index, which provides child and parent domain scores and 13 subscales, was analyzed using two 2×4 MANOVA's. Parents of children in the neurological group reported significantly more stress on the child domain than the other three groups ($p < .05$). This significant difference between the groups was present at both entry into the infant program and after receiving intervention for 6 months. Examination of the subscales in this domain reveals that four of the six subscales would be considered clinically significant, falling into the 90-95th percentile range (adaptability, acceptability, demandingness and mood). Clinically significant elevated subscales were not present in the other three diagnostic groups. These results suggest that parents of children with a diagnosed neurological disorder may need greater professional attention in dealing with the stressful characteristics of their child. Further research is needed to establish what form this intervention should take.

P61.

Mitochondrial Encephalomyopathy with Central Hypertension

F.A. BOOTH and S.S. SESHIA (Winnipeg, Manitoba)

The clinical manifestations of the mitochondrial disorders are diverse. The central nervous system is frequently affected and brainstem dysfunction may be prominent. Central hypertension has not been described as a cardinal finding. We describe a boy with clinical and biochemical features of a mitochondrial disorder in whom paroxysmal hypertension was a significant feature. The patient age 7 years initially developed progressive fatigue, incoordination and disordered eye movements and respiration, followed by respiratory and cardiovascular collapse. Neurological findings included decreased eye movements, nystagmus, intention tremor, diffuse weakness, absent ankle reflexes and extensor plantar responses. Following stabilization, blood lactate was initially elevated and CSF lactate was persistently elevated. He then had three episodes of throbbing occipital headache, diaphoresis and flushing of the upper body and hypertension with blood pressures up to 220/165. Subsequently, blood pressures have remained normal. Although levels of VMA, HVA and catecholamines in the urine were initially elevated, subsequent values have been normal. Imaging studies have not shown a pheochromocytoma. CSF lactate has remained elevated, and the lactate/pyruvate ratio in fibroblasts is abnormal. An older brother had two episodes of cranial nerve and cerebellar dysfunction and has a persistently elevated CSF lactate. Our case suggests that severe paroxysmal hypertension of central origin may be another manifestation of mitochondrial disease, and reinforces the importance of determining CSF lactate is normal. The enzymatic defect in our case is under investigation but is likely to be in the electron transport chain and may well be more marked in the brainstem than in peripheral tissues.

P62.

Juvenile Cytoplasmic Body Myopathy: A Distinct Clinical Entity?

M.B. CONNOLLY, R.W. TYSON and E.H. ROLAND (Vancouver, British Columbia)

Isolated reports of cytoplasmic body myopathy in childhood reveal a wide spectrum of clinical features and severity. We report the clinical features, laboratory and muscle biopsy studies of a North American Indian girl with this entity.

The patient was a 16-year-old girl with no family history of consanguinity or neuromuscular disease. The birth history and early developmental milestones were normal. From the age of 4 years, there was growth failure, severe weight loss and cachexia. She was investigated for delayed puberty and amenorrhea. Progressive thoraco-lumbar scoliosis developed at 14 years. At 15 years, she complained of fatigue, shortness of breath and somnolence. There was no complaint of weakness or history of respiratory infection. Examination revealed a thin, intelligent girl with normal height but low weight (27 kg). There was marked thoracolumbar scoliosis but no joint contractures. She had generalized reduction of muscle bulk, mildly myopathic facies with severe weakness of sternocleidomastoids, neck flexor, intercostal and abdominal muscles and mild weakness of proximal limb-girdle muscles. Tendon reflexes were absent.

Abnormal laboratory investigations included mild elevation of creatine phosphokinase 410 IU/l (normal < 120 IU/l); mild respiratory acidosis (pH 7.34, $pCO_2$68, $pO_2$89), marked reduction of FEV 0.59 (expected: 1.85) and FVC 0.69 (expected: 2.13). Endocrine investigations revealed decreased estradiol but normal thyroid function studies, cortisols, FSH and LH. Nerve conductions and F-wave responses were normal. No clear myopathic or neuropathic units were identified on electromyography. However, decreased interference pattern was observed. Biopsy of quadriceps muscle was markedly abnormal with numerous degenerating fibres and scattered peripheral cytoplasmic inclusions in Type I and II fibres. Electron microscopy demonstrated broadening and disorganization of Z bands and Z band streaming.

The patient requires oxygen by nasal prongs at night. Intermittent ventilation is under consideration.

The clinical features of our patient were strikingly similar to those of four other reported cases of severe cytoplasmic body myopathy of juvenile onset. Although cytoplasmic bodies have been considered a nonspecific feature of neuromuscular disease, they may signify a distinct, clinically recognizable entity in this age group.

P63.

Syringomyelia in Gorlin's Syndrome: a New Associated Defect?

J.-P. BOUCHARD, R.W. BOUCHARD, J. DOYON, P. GRONDIN, P. MORENCY and R. PERUSSE (Quebec City, Quebec)

A number of neurological findings and spinal abnormalities have been described in Gorlin's syndrome, also called "basal cell nevus syndrome" or "the fifth phacomatosis". It is transmitted by an autosomal dominant gene. The main neurological stigmata include calcification of the falx, tentorium and petroclinoid ligaments, mental retardation, EEG changes and hydrocephalus. Medulloblastoma, anosmia, agenesis of corpus callosum, cranial nerve involvement and prominent medullated nerve fibers in the retina have also been less frequently reported. Vertebral and rib abnormalities are common (60%).

We have investigated a family with this syndrome and have found a hitherto not described associated malformation in Gorlin's syndrome: Arnold-Chiari malformation (type I) and a symptomatic cervicothoracic syrinx were found in the mother (age 48). Three of her children were affected and presented with numerous cysts of the jaw, calcification of the usual intracranial structures and skin stigmata. Lack of segmentation of vertebrae and lack of fusion of laminae were present in all children. MRI of the cervical spine did not disclose any syrinx in the children. Their neurological examination was normal. The results of a comprehensive neuropsychological evaluation were also within normal limits in the two patients tested so far.

We discuss the occurrence of syringomyelia as a possible new associated neurological defect in Gorlin's syndrome.

P64.

Congenital Anosmia

J.A.R. TIBBLES, J.K. MARTIN and S. STYLES (Victoria, British Columbia)

Congenital anosmia is uncommon and is typically seen either as an isolated genetic disorder or as part of a complex such as Kallmann's syndrome. We report three cases.

CASE 1. Female. Aged 11 years. Had never been able to recognise smells, but was only made aware of this a few months prior to being seen. Unable to smell food being barbecued, onions or other pungent odours. History otherwise non-contributory. Examination normal except for total anosmia. CT Scan normal.

CASE 2. Female. Died in residential care aged 29 years. Born with cleft lip and palate. Profound mental retardation and generalized seizures. Negative family history. Examination; no axillary or pubic hair or breast development. Autopsy; brain weight 1300 gms. Absent olfactory bulbs.

CASE 3. Male. Died in residential care age 27 years. Born with severe spastic quadriplegia and later generalized seizures. Family history negative. Autopsy; prepubescent penis. Brain weight 940 gms. Olfactory nerves absent. Pachygyria and agenesis of corpus callosum.

Both Gowers and Osler mention congenital anosmia with absence of the olfactory nerves; reports of familial anosmia have appeared since 1918. Kallman described the first cases of hypogonadism and anosmia with other anomalies in 1944 and the syndrome has since been further delineated.

Recognition allows relevant investigations to be carried out and counselling on the hazards of anosmia.

P65.

Failure to Recognize Status Epilepticus in a Paralysed Child

R.I. MUNN and K. FARRELL (Vancouver, British Columbia)

Paralysis may be useful in the management of raised intracranial pressure. However, it essentially precludes the recognition of seizures. We describe a previously healthy patient in whom clonic status epilepticus was not recognized until paralysis was withdrawn.

The patient was a 14-year-old girl who presented with a 5 day history of fever, headache, vomiting and diarrhea. She was combative and disorientated but had no focal neurological signs. In order to perform a CT scan, she was paralysed and ventilated electively. She received IV morphine and pavulon over 14 hours in order to facilitate ventilation. When paralysis was discontinued, continuous twitching of facial muscles, deviation of eyes to the right and clonic movements of all 4 extremities were observed. EEG demonstrated continuous generalised electrical discharges originating from the left temporal lobe with occasional independent spikes from the right anterior temporal lobe. The CT scan was normal and the CSF demonstrated no abnormality. The underlying cause of the status epilepticus was not determined. The seizures were controlled with phenobarbital, phenytoin and carbamazepine and the patient received acyclovir for 10 days.

The patient had been an average to above average student prior to this illness. However, seven months after the illness, she had frequent partial complex seizures and cognitive impairment. WISC-R verbal score was on the 2nd percentile (mild mental retardation range) and performance score on the 6th percentile (borderline range).

The neurologic morbidity in this patient may relate an underlying encephalopathy which manifested as coma and status epilepticus. However, the absence of CSF pleocytosis makes a diagnosis of encephalitis less likely and suggests that the delay in recognition of the status epilepticus contributed to her present neurologic problems. This case highlights the potential danger of the use of paralysis in patients at high risk for seizures.

P66.

EEG Power Asymmetry in Premature Infants

E.A. MACDONALD and D.G. BRUNET (Kingston, Ontario)

Forty-four premature infants were examined neurologically and with serial spectral analysis of EEG. All were less than 34 weeks gestation on entry and restudied every two weeks until discharge from hospital. 33 infants were examined between age 3 and 5 years, 18 were neurologically intact.

EEG power was higher on the right side in 109/125 recordings studied. There was no evidence that presence or absence of asymmetry predicted intact outcome or cerebral dominance.

P67.

A First Focal Seizure and Fever EEG Features of Encephalitis

P. DIADORI, H.Z. DARWISH, M. FALLON and T. JADAVJI (Calgary, Alberta)

The neurologist faced with a child with a first focal seizure and a febrile illness has to exclude the diagnosis of encephalitis. Usually the presence of WBC in the CSF settles the issue. In some children, the first CSF specimen does not show leukorrhachia.

We reviewed 29 children who had focal seizures and fever, and assessed their first EEG blind. 14 children did not have encephalitis. Of the 15 with encephalitis, 6 had serological or biopsy confirmation of *herpes simplex*.

We used the features already described in the literature in evaluating the EEG. We assigned values for: the presence of "complexes", their morphology, location, and their periodicity; we also assessed the type of

delta waves in the background, their relation to complexes, and the delta patterns; finally we noted the reactivity and variability of the record, and the presence of "spikes", or electrographic seizure patterns.

The most useful features differentiating the encephalitic from non-cephalitic groups were the presence of very slow delta (0.5-1.5 Hz) with a background of other delta rhythms, coexisting with regional or diffuse amplitude suppression.

We are attempting to correlate the EEG features in the first EEG with the final outcome in the children with encephalitis who received Acyclovir.

P68.

Multiple Sulfatase Deficiency Presenting with Early Severe Retinal Degeneration

M.G. HARBORD, R. BUNCIC, M.A. SKOMOROWSKI and J.T.R. CLARKE (Toronto, Ontario)

Multiple sulfatase deficiency (MSD) is an autosomal recessive condition characterized by deficiency of arylsulfatases A, B, and C, and other lysosomal sulfatases. Patients generally exhibit combined features of late infantile metachromatic leukodystrophy, MPS storage disorder, and X-linked ichthyosis. Neurodegeneration, spasticity, coarse facial features and dysostosis multiplex generally become manifest by age 2 yrs. followed by the development of generalized ichthyosis. Visual failure is usually a late feature. We report an unusual case of MSD with early, severe visual impairment associated with retinal pigmentation which along with rapidly progressive developmental regression and the absence of clinical signs of non-neurological involvement, initially suggested a diagnosis of neuronal ceroid lipofuscinosis. Screening tests for MPSuria were negative; however, chromatographic analysis of isolated urinary MPS showed increased excretion of haparan sulfate. Enzyme assays of cultured skin fibroblasts confirmed deficiencies of arylsulfatase A (9% of normal), arylsulfatase B (12%), arylsulfatase C (25%), heparin N-sulfatase (15%), iduronate sulfatase (13%), and N-acetyl-galactosamine-6-sulfate sulfatase (20%). Levels of hexosaminidase, beta-galactosidase, beta-glucuronidase, and alpha-mannosidase were within normal limits. Experience with this case indicates that MSD should be considered in patients with neurological regression and visual impairment, even in the absence of clinical features of MPS storage disease.

P69.

Predicting Response to Nonosmotic Diuretics in Hydrocephalus in Infancy

A. KABANI, H.Z. DARWISH and S.T. MYLES (Calgary, Alberta)

The use of the Baltimore Protocol for treating infants with hydrocephalus is still not widely accepted. H. Hoffman has suggested that use of a grading scheme for lumbar intrathecal Te99CSF dynamic studies would predict those who must be shunted from those who need "no" therapy and may be falsely considered to have responded to diuretics.

We have started a prospective study systematically utilizing CSFTe99 studies, Ladd-ICP monitoring, pulsatility index and VEP and EEG studies before and after initiating therapy with Nonosmotic diuretics.

To date five patients have fallen into Hoffman's grades 5, 6 or 7 on CSF study. Three have responded well long term to nonosmotic diuretics. One had persistent vomiting forcing withdrawal of medical therapy and one had only a transient response in head growth. In all five infants, the ICP was decreased by an average 40% from baseline, with abolition of high peaks. Pulsatility index changed with ICP but not with ventricular size.

This study is continuing and results of additional patients and changes in EEG and VEP will be discussed.

Diuretic therapy significantly decreases ICP, but may not return it to normal. It slows head growth velocity but does not return it to normal. Ventricles remain large but ventricular index decreases. The severity of disturbance on CSFTe99 flow studies does not predict failure of diuretic therapy.

Epilepsy

P70.

Anterior Temporal Encephalocele and Medically Intractable Seizures: Surgical Considerations

R. LEBLANC, D. TAMPIERI, Y. ROBITAILLE, F. ANDERMANN, A. OLIVIER and A. SHERWIN (Montreal, Quebec)

We describe the association of temporal lobe encephaloceles and medically intractable seizures successfully treated surgically.

Two males and 1 female, aged 26-36 years (mean 30.6 years) had onset of complex automatism and generalized tonic-clonic seizures in the 2nd and 3rd decades (mean 22.3 years) and had been epileptic for 5-14 years (mean 8.3 years) prior to surgery. Their pre-operative assessment included detailed neurological history and physical examination; extensive EEG recordings on progressively decreasing doses of medication with 16-channel scalp and sphenoidal electrodes and prolonged EEG-video telemetry; extensive neuropsychological assessment and intracarotid Amytal testing to lateralize speech and memory functions; and CT and MR imaging. EEGs localized ictal epileptiform abnormalities to the left mesial temporal lobe in all cases and neuropsychological testing revealed dominant temporal lobe dysfunction. MRI demonstrated anterior, basal, medial temporal encephaloceles, extending into the pterygopalatine fossa through a bony defect. At surgery the encephaloceles were noted to lie immediately in front of the uncus, and an area of gliosis extended from the encephaloceles in continuity to the amygdalo-hippocampal region. All patients have been seizure-free following anterior temporal lobectomy, amygdalo-hippocampectomy, resection of the encephalocele and repair of the dural defect.

Anterior temporal encephaloceles are an example of developmental anomalies acting as the substrate for epileptogenesis. It is expected that they will be diagnosed with greater frequency with the advent of MRI. They are to be considered in the differential diagnosis of late onset seizures especially as patients can be rendered seizure-free by resection of the associated epileptogenic area.

P71.

Identification of Two Additional Patterns Related to the 14 and 6/Sec. Positive Spikes

L. CARMANT and J. REIHER (Sherbrooke, Quebec)

Harmonically related 14 and 6/sec. positive spikes are reportedly closely associated with phantom spike-wave complexes. Identification of two additional distinctive patterns seemingly related to 14 and 6/sec. positive spikes prompted a review of EEGs in 100 consecutive patients and in matched controls.

In 6 patients, several minuscule 28/sec. and 14/sec. positive spikes of identical temporospatial distribution are intermingled.

In 28 patients, single, larger, widely distributed, stereotyped diphasic N-shaped potentials measuring up to 200μV commonly follow several positive spikes and then a single negative spike. Each potentials initial component lasts 200msec.; its polarity is opposite that of the preceding positive spikes and that of the late component. The latter extends over one second, often overridden by theta waves. Double phase reversals in bipolar linear montages are common, as with tangential dipoles. Nevertheless, in referential ear derivations, polarity of each component is ubiquitously uniform, as with radially oriented dipoles. Amplitude fluctuation observed in successive exploring electrodes, from frontopolar through temporal and parasagittal regions, can explain seemingly discordant bipolar and referential findings.

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Both patterns occur exclusively in the study group, particularly during light sleep and predominantly in children. The N-shape potential should not be misconstrued for exceptionally prolonged interictal sharp waves, nor for atypical or phantom spike-wave complexes.

P72.

The "Start-Stop-Start" Phenomenon in Subdural Recordings of Epileptic Patients

W.T. BLUME and M. KAIBARA (London, Ontario)

A minority, but significant percentage of subdurally-recorded partial seizures begin for a few seconds, pause for a few additional seconds, then recommence to develop into a complete partial or secondarily generalised seizure. This phenomenon could account for delays in the scalp electrographic expression of clinically symptomatic seizures.

The present work aims to determine the incidence of this phenomenon and its localising value. That is, does the second phase of the attack originate in the same area as the first phase? If the second phase does not initiate in the same region as the first, recognition of this entity may lead to more accurate identification of ictal source.

The study will cover a total of 75 subdural recordings carried out for intractable partial epilepsy in our centre.

P73.

Incontinentia Pigmenti-M.R.I., Neuropathologic Findings and Epilepsy Surgery

N.J. LOWRY, L. ANG, R.W. GRIEBEL and M.B.B. SUNDARAM (Saskatoon, Saskatchewan)

Incontinentia pigmenti is a rare condition. Its pathology is poorly understood and M.R.I. studies have not previously been reported. We report a case of incontinentia pigmenti who recently underwent epilepsy surgery in our centre. She is age 18 years and suffers from a chronic L hemiplegia with intractable seizures of R frontal origin. Her intelligence is normal. CT scan showed an area of focal atrophy R frontal. EEG telemetry recorded seizures of R frontal origin which were confirmed at electrocorticography. R frontal corticectomy was performed. Postoperative ECG showed virtually no spiking but clinical seizure activity persisted at a reduced frequency. Because of this the patient was sent out of province for an M.R.I. scan. This showed more extensive area of glial scarring in R frontal lobe and further surgery is being considered. Neuropathologic examination of the corticectomy shows small wedge shaped cortical scars, and the white matter shows demyelination with gliosis and calcification. Some cortical areas show cytoarchitectural disorganization of neurones suggesting an interference with neuronal migration in addition to areas of probable previous infarction.

The lesions in incontinentia pigmenti may be more widespread than suggested by CT scanning which makes epilepsy surgery more problematical.

P74.

Antiepileptic Drug Concentrations in Patients with Fully Controlled Seizures

M.W. JONES and M. LEVINE (Vancouver, British Columbia)

Buchthal in 1960 first reported that one could achieve successful seizures control if one got beyond a minimal level of 40 µmol/L for Phenytoin. Subsequent studies also verified this but are difficult to interpret by their retrospective nature, mixed seizure populations, multiple drug regimes and methodological limitations of the phenytoin assay. More recent studies have shown that a sizable proportion of patients will have their seizures controlled at levels below 40 µmol/L. In view of what appears to be a controversy regarding the lower limit of a "therapeutic range" we looked at 77 consecutive patients who had gone greater than one year without any epileptic seizures.

RESULTS:

Seizure Type	1 Drug	2 Drugs	3 Drugs	Pts.
Partial	15	11	1	26
Generalized	31	17	2	51
	46	28	3	77

#subtherapeutic on monotherapy - VPA 3/13 (23%); CBZ 1/5 (20%); PHT 8/18 (44%)

CONCLUSIONS: 33% of patients with no seizures for one year will have subtherapeutic levels of their antiepileptic drug. Generalized seizure patients come under full control more readily than partial seizure patients. It would appear for carbamazepine and valproic acid one needs to get closer to the lower limit of the therapeutic range for success, whereas for phenytoin a sizable proportion of 44% of patients were controlled on levels less than 40.

It appears that there is no value in attempting to define a lower limit of the therapeutic range for phenytoin since many patients experience complete seizure control at low serum concentrations.

P75.

Cortical Stimulation and Seizure Surgery in Canada — A Historical Note

F.B. MAROUN, W. FITZGERALD, T. RASMUSSEN, J.C. JACOB and M. SADLER (St. John's, Newfoundland; St. Anthony, Newfoundland and Labrador; Montreal, Quebec; Halifax, Nova Scotia)

In 1909, on the Northern tip of the Province of Newfoundland and Labrador, Dr. John Mason Little Jr. performed one of the earliest seizure surgery in North America with unsuccessful attempts to map the central region by electrical stimulation. A detailed description of the case history, the surgical procedure and its outcome, together with a review of the historical aspect of brain stimulation and cortical excision for epilepsy in humans will be reviewed.

P76.

Ataxia in Institutionalized Patients with Epilepsy

G.B. YOUNG, B.A. GORDON, W.T. BLUME, S. OPPENHEIMER and G.A. WELLS (London; Ottawa, Ontario)

Why some patients with a chronic, medically refractory seizure disorder develop a further disabling progressive ataxia is unknown. We sought to uncover causal factors by studying a 42 randomly chosen institutionalized epileptic patients.

Patients were graded as non-ataxic (NA) or as +, ++, +++ for increasing severity of ataxia using the base width of gait. The patients had been institutionalized for a mean of 25 (range 5-50) years. None of the patients was ataxic on admission to the institution, yet at the time of our study we found 7+++, 15++, 8+ and 12NA patients. Surprisingly, the degree of ataxia failed to correlate with: age, sex, duration of seizures, mean and maximum seizure frequency, seizure type, peak phenytoin levels, previous status epilepticus and fasting plasma/serum levels of the following at the time of examination: anti-epileptic drug levels, lactate, amino acids, B12 and folic acid. The degree of cerebellar atrophy on CT scan correlated with the degree of ataxia.

Acquired cerebellar ataxia was more common among our institutionalized epileptics than in any previously published series of epileptic patients. It likely reflects an individual susceptibility to the interaction of therapy and disease.

P77.

Seizure-Related Injuries and Death in Adult Epilepsy

A. GUBERMAN (Ottawa, Ontario)

Only sparse data are available on the incidence and scope of seizure-related injuries in epileptic patients. Information on the type and frequency of serious seizure-related injuries is important for management decisions in patients with uncontrolled seizures and also may influence patient compliance.

Our retrospective/prospective survey of approximately 1000 adult epilepsy patients (excluding those with Lennox-Gastaut syndrome) identified the following serious seizure-related injuries or deaths in 41 patients:

Death - (cardiopulmonary)	— 4
(drowning)	— 1
Near death (cardiopulmonary)	— 1
(drowning)	— 2
Head trauma	— 5
Other Fractures and Dislocations	— 22
Burns	— 7
Other	— 3

These injuries will be discussed in greater detail and the literature reviewed.

P78.

Inquiries Addressed to Directors of Organizations for Epileptics in Canada and Doctors Concerning Epilepsy and Driving

G.M. RÉMILLARD (Montreal, Quebec)

Questionnaires were sent to 59 groups in Canada and 21 answers were received from all provinces. To the question: Do you think it should be the responsibility of the treating physician to report all epileptic patients to legal authorities? The answers were very uniform and in support that patients remain in authority over reporting to licensing bodies concerning their drivers licences when individuals are responsible. "Why should legal authorities have access to a responsible adult's medical condition? Why should responsible and irresponsible adult be treated in the same manner?

A questionnaire was distributed at different medical meetings between 1986 and 1989. Attending members were free to answer the survey. To the question: Would you agree to the legal obligation by your provincial government to report to the registry of Motor Vehicle all patients with recurrent loss of consciousness?

Amongst 24 Quebec general practitioners, 91% answered yes. Amongst 24 neurologists members of the Association des Neurologues du Québec and 14 neurologists and neuropediatricians members of the Canadian League Against Epilepsy, 90% answered no.

Organization for epileptics should participate in legal decisions concerning epilepsy and motor vehicle driving. Also neurologists who see a larger number of epileptics are more likely to suggest a more realistic and applicable legal policy concerning epilepsy and motor vehicle driving.

P79.

B.C. Traffic Accidents Statistics as Relates to Those Patients with Epilepsy

M.W. JONES (Vancouver, British Columbia)

Patients with epilepsy whose seizures are fully controlled presumably are safe to drive. With that background the driving statistics for accidents were analyzed for the Province of B.C. for the population at large. Then the subgroup of individuals with epilepsy with valid licences were looked at to find out what their accident rate was. In 1986 there were 1,394 individuals with "controlled epilepsy" who were legally driving. They were involved in 125 accidents that year. For the general population as a whole the accident rate for 1986 was 4.9/100 licenced drivers. For the subgroup of patients with epilepsy or seizures it was just less than twice this at 9.3/100 licenced drivers. Taking the combined figures for 1985 and 1986 an individual with epilepsy was approximately 1.8 times more likely to be involved in a motor vehicle accident than the general public.

The teenage driver with "epilepsy" appeared safer, being involved in half as many accidents as his peer group.

In 47 out of 237 accidents (20%) the reporting police officer was able to say the accident was likely caused by the individual having a seizure.

The accident rates were similar whether the patient was on or off antiepileptic drugs. Approximately 15% of people with "controlled seizures" are no longer on antiepileptic drugs.

For the subgroup with epilepsy with controlled seizures they are virtually all controlled with one or other singly or in combination of the following drugs: phenytoin, carbamezapine or valproic acid.

Cerebrovascular

P80.

Cerebral Aneurysms in Polycystic Kidney Disease

A. LOZANO and R. LEBLANC (Montreal, Quebec)

Adult polycystic kidney disease (APKD) is an autosomal dominant disorder in which up to 40% of patients have an intracranial aneurysm. The basis of this association is unknown. We have compared cerebral aneurysms in patients with APKD, using the chi^2 test, to the sporadic aneurysm cases reported by the Cooperative Study to determine if there are significant biological differences between these two groups. Seventy-nine patients with aneurysmal subarachnoid hemorrhage (SAH) and APKD were studied. Sixty-eight had a single aneurysm and 11 (14%) had multiple aneurysms. In APKD patients with SAH from a single aneurysm there was a significant over-representation of males (72%, $p < .01$). APKD patients more frequently had aneurysms of the middle cerebral artery (37%, $p < .05$) and fewer of the internal carotid artery (18%, $p < 0.1$). The peak decennial incidence and mean age of rupture of APKD aneurysms was younger (mean age 39.7 years, $p. < 0.01$) and over 75% of APKD-associated aneurysms had ruptured by age 50 vs 42% for sporadic aneurysms ($p < 0.001$). Cerebral aneurysms co-existed with APKD in the absence of hypertension in 25% of 44 cases where the presence or absence of hypertension was recorded. 80% of the APKD patients with cerebral aneurysms died of the initial SAH.

Although arterial hypertension may have contributed to the earlier rupture and more virulent course of some APKD-associated aneurysms, the biological differences of APKD aneurysms and their occurrence in normotensive APKD patients suggests an etiology which may be independent of hypertension, and that APKD-associated aneurysms may be genetically determined. We suggest that familial aneurysms could also be linked to a genetic defect resembling that which occurs on chromosome 16 in APKD.

P81.

Efficacy of Retrograde Perfusion of the Cerebral Vein with Verapamil in Fischer-344 Rats with Focal Cerebral Ischemia

Y.L. YAMAMOTO and T. HOSAKA (Montreal, Quebec)

Recently, Duverger et al (1988) reported that the Fischer-344 rats presented consistent and sizeable infarcted tissue volume by occlusion of the middle cerebral artery (MCAO).[1] Osborne et al (1987) also described a method for quantitative assessment of volume of early cerebral ischemic damaged tissue in rat with MCAO which was found to be

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reliable for assessing drug therapy and management strategies in the treatment of cerebral ischemia.[2] We therefore examined the effectiveness of retrograde transvenous perfusion of the inferior cerebral vein (TVPOB) with verapamil and autologous arterial blood at 150 mmHg retrograde perfusion pressure as compared to the control group in Fischer-344 rats with 5 hours after MCAO where the treated rats with TVPOB and verapamil or I.V. of verapamil were started 3 hours after MCAO for 2 hours.

METHOD: Animals were divided into three groups of six. Group A received only MCAO. Group B received verapamil intravenously 3 hours after MCAO for 2 hours. Group C received verapamil and blood by TVPOB. Five hours after MCAO, the brains were studied for local cerebral blood flow (LCBF) using autoradiography with ^{14}C-iodoantipyrine and quantitative volumetric assessment of cerebral infarct using Osborne's method.

RESULTS: Group B (I.V.) showed no significant changed of LCBF and infarct volumes as compared to the control group. Group C (TVPOB) with verapamil and blood) showed a significant increase of LCBF in the ischemic cortex (66-67%, $p < 0.01$), and in the caudate nucleus ((63%, $p < 0.05$), and a significant reduction of cerebral infarct volume in the parietal level (31%, $p < 0.05$) and in the sensorimotor level (33%, $p < 0.01$) as compared to the control group.

CONCLUSION: This study indicated that this combination of TVPOB with verapamil and blood at 150 mmHg perfusion pressure resulted significant beneficial effects on LCBF and cerebral infarct volume in the Fischer-344 rats with permanent MCAO starting therapeutic procedure 3 hours after MCAO.

(Supported by MRC (MT-3174) and Eli Lilly Grant)

[1]Duverger D, et al. JCBF & Metab 1988; 8: 449-461.

[2]Osborne KA, et al. J Neurol Neurosurg Psychiat 1987; 50: 402-410.

P82.

Relaxation Effects of Various Potassium Channel Openers on Canine Basilar and Common Carotid Arteries

H. ZHANG, K. KANAMARU, B.K.A. WEIR, N. STOCKBRIDGE, C.A. KRUEGER and D.A. COOK (Edmonton, Alberta)

Vascular responses to Potassium Channel Openers, Nicorandil, Pinacidil, Cromakalim and Minoxidil were studied in rings of canine basilar (BA) and common carotid arteries (CCA) (N = 33). Nicorandil, Pinacidil and Cromakalim relaxed both BA and CCA precontracted by prostaglandin F2a (PGF2a) or Noradrenaline (NA). However, Minoxidil did not cause significant relaxation of BA or CCA. Cromakalim, Nicorandil and Pinacidil appeared more effective in CCA than in BA. Cromakalim produced a significant relaxation for CCA more than BA at 10-6, 3 × 10-6 and 10-5 M ($p < 0.05$). Nicorandil and Pinacidil induced significant relaxation in CCA rather than BA at 10-5 M ($p < 0.05$), but not at 10-6 and 3 × 10-6 M ($p > 0.05$). The PD2 values for Cromakalim were also significantly different between BA and CCA ($p < 0.05$). The PD2 values for Nicorandil and Pinacidil were not significantly different between BA and CCA ($p > 0.05$). The relaxant effects caused by each drug on BA were in the order of Nicorandil > Pinacidil > Cromakalim > Minoxidil. There was no significant difference in relaxation of BA between Nicorandil and Pinacidil, but there was a significant difference between Pinacidil and Cromakalim at 10-5 M ($p < 0.05$). The relaxant effects in CCA were in the order of Cromakalim > Nicorandil > Pinacidil > Minoxidil. Nicorandil at 3 × 10-6 M and Pinacidil at 10-6 and 3 × 10-6 M were less effective in CCA than Cromakalim ($p < 0.05$). The sensitivities of these drugs may be different between intracranial and extracranial arteries. Nicorandil appeared more effective in BA, while Cromakalim was more effective in CCA. These results suggest that Nicorandil and Pinacidil may be effective in preventing cerebral vasospasm after subarachnoid hemorrhage and deserve further investigation.

P83.

Chronic Caffeine Protects Against Ischemic Neuronal Injury

H.J. LESIUK, G.R. SUTHERLAND, J. PEELING, R.M. BROWNSTONE. RYDZY, K. BUTLER, J.K. SAUNDERS and J.D. GEIGER (Winnipeg, Manitoba; Ottawa, Ontario)

Post-ischemic neuronal injury may in part reflect imbalances between excitation and inhibition (post-ischemic hyperexcitation). Adenosine, an inhibitory neuromodulator, has been implicated as a putative neuroprotectant in ischemia. Therefore, the effect of caffeine, an adenosine antagonist, was evaluated in rats subjected to forebrain ischemia. Ischemia was induced by bilateral carotid occlusion/controlled hypotension (50 torr) for 10 min. Acutely treated rats received either caffeine (10 mg/kg) saline vehicle, iv, 30 min. pre-ischemia. Chronically treated rats received increasing oral doses of caffeine (up to 90 mg/kg/24 hrs) for 3 wks prior to ischemia. Coronal high-resolution (100 µm) multi-slice, multi-echo magnetic resonance images were obtained daily for three days. The animals were sacrificed with histologic examination of perfusion-fixed brains. Control animals demonstrated MRI changes indicative of ischemic neuronal damage, confined to the striatum at 24 hrs, with hippocampal damage evident at 48 hrs. By 72 hrs partial resolution of the changes had occurred. Acutely caffeine-treated rats showed accelerated neuronal damage in both striatum and hippocampus. Chronically treated rats showed significantly less neuronal damage in all brain regions. Quantitative histology of hippocampus and striatum confirmed the MRI changes. We conclude that acute caffeine treatment accelerates neuronal injury by potentiating post-ischemic hyperexcitation, whereas chronic caffeine ameliorates ischemic injury by upregulating adenosine receptors, thereby inhibiting post-ischemic hyperexcitation.

P84.

Treatment of a Mid-Basilar Trunk (AICA) Aneurysm by Endovascular Detachable Balloon Occlusion of the Aneurysmal Sac: Case Report

J-L CARON, J. RAYMOND and S. FONTAINE (Montreal, Quebec)

Supra-selective catheterization techniques can now be applied to almost any intra-cranial vessel larger than 2 mm in lumen diameter. The addition of detachable balloons in combination with slowly solidifying polymers have opened the door to new clinical applications in interventional neuroradiology. One condition to which these techniques can be applied are saccular intracranial aneurysms. It is now possible to enter the aneurysm sac, inflate the balloon to conform to its shape, and to detach the balloon preserving the parent artery yet occluding the entire aneurysm.

This short communication is to report a 42-year-old female having suffered a grade II subarachnoid hemorrhage. Angiography revealed a 1.7 cm mid-basilar trunk aneurysm just at the origin of the left AICA. Attempts to clip the aneurysm via a sub-temporal trans-tentorial approach were unsuccessful and the aneurysm was left unclipped planning for an endovascular approach. Three months later she underwent an endovascular catheterization of the aneurysm and a balloon was guided into the aneurysm, inflated, and detached preserving the parent basilar artery. The technique will be described with the help of photographs. No complication in this particular case was encountered.

P85.

L'approche combinée de la neuro-radiologie et de la neurochirurgie dans le traitement d'une malformation artério-veineuse cérébrale géante

J-L CARON, J. RAYMOND and S. FONTAINE (Montréal, Québec)

Il est reconnu que le traitement des angiomes cérébraux est dans une période quelque peu controversée. Les petits angiomes profonds ou

même superficiels pourront probablement être guérri par irradiation focalisée. Le traitement des angiomes de taille moyenne demeure probablement chirurgical spécialement si la malformation est située dans une région «silencieuse» du cerveau. Par contre les angiomes géants peuvent être d'une complexité chirurgicale parfois insurmontable. Nous décrivons ici le cas d'un jeune homme de 23 ans qui a subit une hémorrhagie intracérébrale pariétale gauche. L'examen neurologique demeura normal incluant un examen neuro-ophtalmologique. L'angiographie cérébrale démontra une malformation artério-veineuse de 6 × 8 cm. dans le lobe pariétal gauche. Nous décrivons la stratégie d'embolisation préoperatoire de vaisseaux perfusant le nidus vasculaire par cathétérisme supra-sélectif des branches tertiaires de l'artère cérébrale moyenne dans le but de réduire le débit sanguin de la malformation. L'embolisation fut suivit d'une exision chirurgicale radicale.

P86.

EEG Frequency Analysis and Topographic Mapping in Lacunar Infarction — A Preliminary Study

T.E. HOGAN and A. SHUAIB (Saskatoon, Saskatchewan)

Patients with lacunar infarcts make up 20% of the stroke patients seen at the University Hospital. The assessment of the patients includes a CT Scan and occasionally an EEG which is often normal.

Macdonnell et al[1] investigated the use of standard EEG and CT in patients with acute ischemic stroke. They found lateralized abnormalities in 9% of the EEGs and 18% of initial CT scans in patients with lacunar infarcts. The low yield of abnormalities detected by these procedures prompted us to seek a more sensitive method of detection.

It has been shown that the standard EEG can detect physiologic abnormalities that are not seen with CT. These abnormalities may be very subtle in patients with lacunar infarcts and therefore escape detection by visual inspection of the EEG. With the introduction of computer EEG mapping the sensitivity of the EEG may be extended. The process of digitizing the analog signal, quantifying and analyzing the different frequency signals might allow the identification of discreet irregularities.

This prospective study of patients with the probable diagnosis of lacunar infarction admitted to the University Hospital over the last year was undertaken to evaluate i) the sensitivity of EEG mapping techniques compared with standard EEG ii) how often does EEG mapping show focal abnormalities when the CT is normal? iii) and when abnormalities are present a) what type? b) are there any correlation with clinical signs, symptoms and neuroimaging.

The results of this study will be discussed at the time of presentation.

[1]Macdonnell RAL, Donnan GA, Bladin PF, Berkovic SF, Wriedt CHR: The EEG and Acute Ischemic Stroke. Distinguishing cortical from Lacunar Infarction. Arch Neurol 1988; 45: 520-524.

P87.

Isolated Middle Cerebral Artery Branch Disease Following Cranial Radiotherapy

D.M. MCILRAITH and R. COTE (Montreal, Quebec)

Radiation induced vasculopathy affecting small arteries was first recognized in the last century. More recently injury to medium and large vessels as a result of radiotherapy has been described. Reports of damage to the intracranial arteries are sparse and have emphasized involvement of the distal internal carotid artery. Little is known of the determinants of the development of this condition and its natural history.

We report a 40-year-old man with bilateral carotid territory transient ischemic attacks first occurring 1 year after radiotherapy for pineal seminoma, markedly increasing in frequency and severity 7 years later. Cerebral angiography was normal apart from segmental narrowing of the posterotemporal branch of the right middle cerebral artery consistent with atherosclerosis. Investigations for other causes of ischemia were negative.

The pathogenesis and clinical implications of arterial injury secondary to therapeutic radiation are reviewed.

P88.

"Silent" Strokes and Carotid Stenosis

C.Z. ZHU and J.W. NORRIS (Toronto, Ontario)

The occurrence of "silent" (asymptomatic) strokes in the vascular territory of carotid artery stenosis (CAS) may affect surgical or medical management. Using CT scanning, we compared the prevalence of cerebral infarction on 178 patients with CAS + TIAs, 105 asymptomatic patients with CAS, and 61 with TIAs and normal carotid arteries. Vertebrobasilar TIA patients were excluded.

In the total patient population (344) there were 121 infarcts and 46% (56) were lacunar. Cerebral infarction was demonstrated by CT scan in 46% (82/178) of patients with TIAs + CAS, and in 31% (19/61) of the TIA + normal carotid group. However, in the asymptomatic group there were significantly fewer ($p < 0.05$) infarcts — 19% (20/105). In all patients with CAS, cerebral infarctions were ipsilateral to the most stenosed artery in 80% (97/121).

Only further prospective follow-up can determine whether "silent" strokes have the same prognostic implication as clinically overt strokes or TIAs.

P89.

Electroencephalography of Acute Embolic Stroke in a Rabbit Model

R. SHARMA, E.H. KLIMEK, D. FOURNIER, W.J. MONTANERA, J. GLEN and K. TERBRUGGE (Toronto, Ontario)

The method and findings of EEG monitoring of New Zealand White rabbits during acute embolic hemispheric stroke are presented. The changes in the EEG can be detected within minutes and are progressive using conventional equipment. The affected hemisphere has an evolving decrease in fast activity and a reduction in amplitude. The EEG has been a predictable, reproducible and sensitive adjunct in the investigation of acute stroke in this animal model.

Neurosurgery

P90.

Brucellar Spondylitis

N.A. RUSSELL, K.A. ARABI, A. YOUSSEF, M. BEG, A. JOAQUIN and N.A. FAYEZ (Riyadh, Saudi Arabia)

Brucellosis is an infectious disease, caused by bacteria of the genus Brucella and transmitted to man from animals and contaminated animal products. Although North American physicians might consider it to be rare, Brucellosis has a worldwide distribution and is endemic in Saudi Arabia and many other developing countries. Amongst its diverse manifestations are those due to involvement of the spine and scro-iliac joints, so that in these countries it must be considered in the differential diagnosis of patients presenting with back pain. The lumbar spine is most frequently affected and the thoracic spine next. The pain may be acute and radiate into the legs simulating the disc disease. In the early stages plain radiographs may be normal but changes can be detected by radionucleotide studies. Subsequently, there is narrowing of the intervertebral disc space, destruction of adjacent vertebrae and occasionally paravertebral abscess formation. The later states are characterised by bone sclerosis indicative of healing. Diagnosis depends upon serological tests and culture of the organism, but may be facilitated by current

imaging techniques such as CT scanning and MRI. This report reviews the experience with Brucellar Spondylitis at the King Fahad National Guard Hospital, Riyadh, Saudi Arabia. It analyses the clinical and radiological features as well as the methods of diagnosis and efficacy of therapy in this condition.

P91.

Gero-Neurosurgery

T. POLIS, B.G. BENOIT and N.A. RUSSELL (Ottawa, Ontario)

This report analyses a group of patients over 75 years of age admitted to the neurosurgical service of a large general hospital, during the period of 1983 to 1989. The group represents 8.7% of the 3,070 neurosurgical admissions during the study period, whereas this age group represents only 4.5% of the Canadian population in general. Surgery was performed on 67.4%, while the remaining 32.6% were treated medically.

Of the surgical cases, cerebrovascular disease represented 28.9%, tumors 20.6%, extracerebral hematomas 16.7%, degenerative myeloradiculopathy 8.9%, trigeminal neuralgia 7.2%, hydrocephalus 5.6%, trauma 3.9%, cerebral hemorrhage 3.9% and aneurysms 2.2%.

For those over 75 the overall mortality rate was 16.1%, compared to 7% for all patients admitted to the service. Those treated surgically fared better, with a mortality rate of 12.2% contrasted with 23% for the medically treated group. The highest mortality rates were seen with tumors (32.4%), trauma (28.6%) and SAH (25%). No deaths occurred in patients with subdural hematomas or spinal disease.

This analysis of our experience indicates that age alone should not be a contraindication to a neurosurgical procedure, but that higher mortality rates should be expected for those over 75 with tumors and subarachnoid hemorrhage.

P92.

Stabilization of Traumatic Atlanto-Occipital Dislocation

A.J. BELZBERG and B.I. TRANMER (Calgary, Alberta)

Traumatic atlanto-occipital dislocation is most often a fatal injury. Consequently, there are only scattered case reports of patients surviving this injury. Treatment modalities are anecdotal and varied.

We present the case of an eighteen-year-old girl who suffered an anterior atlanto-occipital dislocation as the result of a motor vehicle accident. Rigid posterior fixation and complete reduction of the dislocation was achieved using an anatomically contoured steel loop secured to the occiput and cervical vertebrae. The addition of cancellous bone to the graft afforded long term stability. This novel operative treatment of our patient with traumatic atlanto-occipital dislocation provided anatomical realignment of the dislocation and allowed early mobilization of the patient and use of aggressive rehabilitation.

Previously reported cases of patients surviving atlanto-occipital dislocation are reviewed and an additional case is presented. The use of cervical traction, halo bracing, and operative stabilization is discussed.

P93.

Serious Adult Head Injury in Nova Scotia — An Epidemiologic Review

D.S. MALLOY and R.O. HOLNESS (Halifax, Nova Scotia)

Traumatic Brain Injury is a leading cause of death and disability. To better define the nature of such injuries in Nova Scotia an epidemiologic review of serious head injury has been undertaken. During a 37 month period 150 adults patients with serious head injuries were admitted to the Neurosurgical service at the Victoria General Hospital. Numerous parameters were assessed which have allowed for the development of recommendations for the prevention of these potentially devastating injuries.

P94.

Use of Continuous Somatosensory Evoked Potentials to Select Patients for Decompressive Craniectomy for Refractory Intracranial Pressure Following Closed Head Injury: Report on Two Cases

R.J. MOULTON and W.S. TUCKER (Toronto, Ontario)

The use of decompressive craniectomy for medically uncontrollable intracranial pressure (ICP) following head injury has largely been abandoned. The prevalent view regarding the procedure is that although it may increase survival, the incidence of functional recovery is not increased. It is possible however that the observed lack of improvement in functional outcome may simply be the result of use of the procedure in patients with overwhelming primary impact injury, in whom control of ICP would not be expected to result in functional recovery. Aggressive surgical management of medically uncontrollable ICP in those patients who have not suffered devastating primary impact injury might lead to better patient outcome without an increase in the number of vegetative survivors. Selection of appropriate patients is often complicated by the use of pharmacologic paralysis for the treatment of raised ICP, thereby rendering the neurologic examination impossible at the time when ICP becomes uncontrollable and a decision must be made regarding surgical therapy. This report describes two cases in which continuously monitored somatosensory evoked potentials were used to select patients for bilateral decompressive craniectomy for medically uncontrollable ICP.

P95.

Beneficial Effects of Acupuncture Treatment After Experimental Spinal Cord Injury

M.J. POLITIS and M. KORCHINSKI (Saskatoon, Saskatchewan)

The uses and limitations of "first aid" acupuncture treatment were assessed after spinal cord injury in rats. Spinal cords were exposed to a standardized contusion lesion at T8, followed by electroacupuncture stimulation of three points: (a) B1. 60 (within the depression dorsal to the lateral malleous), (b) B1. 54 (popliteal space) and (c) Gv. 3 (intervertebral space between L4 and L5). Acupuncture treatment was performed at by either 15 min or 24 hrs after surgery. Control rats received spinal cord injury without acupuncture treatment.

Animals were assessed 3 days post-operatively. Results showed improved function (as assessed by a combined behavioral score) in rats which had been treated with acupuncture 15 min after injury relative to those that received no acupuncture treatment. This was accompanied by minimization of post-traumatic cord shrinkage in acupuncture-treated animals and a marked (3 fold) sparing of ventral horn neurons. Plasma cortisol levels rose over 3-fold within 2 hours post-operatively in non-acupuncture-treated animals. None of the above beneficial effects occurred in rats given acupuncture treatment 24 hrs after spinal cord injury.

Results point to a usefulness of acupuncture as adjunct treatment during early stages after spinal cord injury.

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