XVIII Canadian Congress of Neurological Sciences

Combined Meeting with the Association of British Neurologists

St. John's, Newfoundland
June 21 - 25, 1983

Canadian Association for Child Neurology, Annual Meeting, June 21, 1983

MORNING SYMPOSIUM: **Neurologic Disease in Children of Atlantic Canada**

Batten's Disease in Newfoundland	J.C. Jacob
I-Cell Disease	A.R. Cooper
Nova Scotian Niemann-Pick Disease	J.A.R. Tibbles
Cockayne's Syndrome	D. Meek
Neurologic Complications of Cystic Fibrosis	E.J. Gibson
Duchenne Dystrophy in the Maritimes	J. Dooley
Epilepsy in Nova Scotia: Recent Insights	P. Camfield
GUEST LECTURE: **Myasthenia in Children**	J. Newsom-Davis
AFTERNOON SYMPOSIUM: **Childhood Strokes**	R. Humphreys and W.J. Logan

PRE-CONGRESS COURSES - JUNE 22, 1983

Course 1 - **Neuroimmunology**

Chairmen: *T.E. Feasby and G.C. Ebers*

Pathogenesis of Myasthenia Gravis	J. Newsom-Davis
Management of Myasthenia Gravis	J. Newsom-Davis
The Guillain-Barré Syndrome	T.E. Feasby
Immunology of Multiple Sclerosis	G.C. Ebers
Suppressor Cells in Multiple Sclerosis	D.W. Paty
Pathophysiology of Multiple Sclerosis	W.I. McDonald
Diagnosis and Management of Multiple Sclerosis	D.W. Paty

Course 2 - **Involuntary Movements**

Chairman: *Donald Calne*

Anatomy of the Basal Ganglia	Louis Poirier
Physiology of the Basal Ganglia	William Tatton
Parkinson's Disease: Diagnosis, Pathology and Treatment	Robert Lee
Parkinson's Disease: Treatment	Melvin Yahr
Huntington's Chorea	Harold Klawans
Generalized Dystonia	Donald Calne
Focal and Segmental Dystonia	Anthony Lang
Essential Tremor	C.D. Marsden
Tourette's Syndrome	André Barbeau
Olivopontocerebellar Atrophy	Roger Duvoisin

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Course 3 - **Neuro-Intensive Care**
Chairman: *Michael Schwartz*

A. What to Observe	
Clinical Observations and Numeric Scales	Michael Schwartz
Non-Invasion Monitoring - Multimodality Evoked Potentials	Richard Greenberg
Physiology and Clinical Aspects of Raised ICP	Allan Ropper
B. New Technology	
Critical Care Patient Data Management: A Minicomputer System	Mark Stega
The Microcomputer at the ICU Bedside	Fred Gentili
Automation of Decision-Making and Treatment	David Price
C. Specific Problems	
Treatment of Intracranial Hypertension	Allan Ropper
Head Injury: Approaching the Predicted Outcome	Richard Greenberg
Prevention of Cerebral Vasospasm with Calcium Antagonists	Bryce Weir
Treatment of Established Vasospasm	Quentin Durward

SPECIAL LECTURES AND SYMPOSIA

THURSDAY, JUNE 23, 1983

Presidential Address
The Neurologist as Educator - T.J. Murray, Halifax

Royal College Lecture
The Ocular Manifestations of Multiple Sclerosis - W.I. McDonald, London, England

McNaughton Prize Lecture

McKenzie Prize Lecture

Honored Guest Lecture - Canadian Neurological Society
A Systematic Approach in Clinical Research - André Barbeau, Montréal

FRIDAY, JUNE 24, 1983

Symposium: Regeneration of the Nervous System
Chairman: *R. Riopelle*

The Neurone and its Milieu - Implications for Maintenance and Regeneration	R.J. Riopelle
Axonal Regeneration from Adult Mammalian Central Nervous System	A.J. Aguayo
Trophic Factors in Normal and Injured Peripheral Nerve	P.M. Richardson
Functional Transplants of Vasopressin Neurones	D.N. Gash
Connections Formed and Not Formed by Neural Transplants into the Brain	G. Raisman
Penfield Lecture - Canadian Neurosurgical Society *Clinical Aspects of Cerebrovascular Research*	Lindsay Symon, London, England

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SATURDAY, JUNE 25, 1983

Seminar 1: Recent Advances in Therapy of Neurological Disorders
Chairman: *J. Newsom-Davis*

Cerebrovascular Disease	Charles Warlow
Parkinson's Disease	Gerald Stern
Neuromuscular Diseases	J. Newsom-Davis
Multiple Sclerosis	Alistair Compston
Viral Encephalitis	Michael Swash
Peripheral Neuropathy	P.K. Thomas

Seminar 2: Pet & NMR Imaging of the CNS: New Developments in Canada
Chairman: *Donald Paty*

Introduction	D.W. Paty
Basic Principles of PET Scanning	Brian Pate
Physiology of Normal Brain - PET Studies	Stephen Garnett
PET in Epilepsy	Pierre Gloor
Investigation of Potential Stroke Therapy by PET	A.M. Hakim
Metabolism and Pharmacodynamic Aspects of Brain Tumours Studied by PET	J.G. Villemure
Status of PET at Queen's University	R.J. Riopelle
Physiological Studies of Movement using PET	Donald Calne
Basic Principles of NMR	Laurie Hall
NMR Clinical Images	D.W. Paty

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XVIII Canadian Congress of Neurological Sciences Abstracts of the Scientific Program

Platform Presentations

1.

Deficiency of Phospholipase C in Niemann-Pick Disease

J.R. WHERRETT, and S. HUTERER (Toronto, Ontario)

We have shown (Neurology Minneapolis (1983) 33:67) that the phosphodiesterase affected by the mutant gene in Niemann-Pick (NP) disease has specificity for a phosphoglyceride, phosphatidylglycerol, as well as for sphingomyelin. This suggested that acid sphingomyelinase may represent one activity of a phospholipase C with broad substrate specificity. We therefore examined the capacity of control and NP fibroblast lines to catalyze phosphodiesterase, cleavage of phosphatidylcholine. Release of labelled glyceride from 2-[1-^{14}C] oleoyl phosphatidylcholine was catalyzed by a soluble extract of control human fibroblasts, was maximal at pH 4.5 and was strongly stimulated by sodium taurocholate. Assay of activity in fibroblast cultures from eleven patients with various forms of NP disease revealed a severe deficiency in only those cultures also deficient in sphingomyelinase. Distribution of label in the products of the reactions catalyzed for both control and NP extracts indicates that the phosphodiesterase activity observed was phospholipase C and that phospholipase D was not involved. Thus there is a close correlation of phospholipase C activities toward phosphatidylcholine and phosphatidylglycerol and toward sphingomyelin in control and mutant NP fibroblast lines. This strengthens further the suggestion that the enzyme affected in NP disease is a phospholipase C of broad substrate specificity. Different mutations affecting the specificity of this enzyme may underlie phenotypic variation in NP disease. (Supported by MRC).

2.

Three Cases of Behr's Syndrome

P.K. THOMAS and J.M. WORKMAN (London, England)

Behr's syndrome consists of a slowly progressive spinocerebellar degeneration with an infantile onset. It is associated with optic atrophy and severe visual loss, and mental retardation. Both autosomal dominant and autosomal recessive inheritance have been described.

Three cases of this syndrome have been investigated, one single case and two siblings from a family exhibiting pseudodominant inheritance. All three showed severely reduced intelligence, optic atrophy, visual failure and dysarthria. In the limbs, there were bilateral cerebellar and pyramidal signs and tendon areflexia. Nerve conduction studies were performed in two cases. Motor nerve conduction was normal in both, as was sensory conduction in one; in the other, sensory nerve action potentials were absent. A muscle biopsy from the former revealed fibre type grouping. In the latter, a biopsy showed minor myopathic features but conspicuous fuchsinophilic inclusions. On electron microscopy these were found to be aggregates of cylindrical spiral membranous inclusions. A nerve biopsy from this case revealed a combination of demyelination and axonal degeneration.

It is concluded that Behr's syndrome is likely to be genetically heterogeneous.

3.

The Influence of Otolith Stimulation on Nystagmus in the vertical plane

P. RUDGE, M.A. GRESTY and L.J. FINDLEY (London, England)

Downbeating and upbeating nystagmus, present in the primary position of gaze are valuable clinical signs which are evidence of lesions in the cerebellar flocculus and the central tegmentum of the brainstem respectively. Modern theories of the genesis of such nystagmus propose that the mechanism is either an asymmetry of vertical canal function or of smooth pursuit which produces a tonic bias on the eye position resulting in an upward or downwards drift. Early reports in the otological literature assert that vertical nystagmus is frequently provoked by otolith stimulation although the direction and characteristics of the nystagmus were not clearly described. Accordingly we examined patients with up and down beating nystagmus to establish whether the nystagmus was profoundly influenced by static tilt and linear accelerations. In two patients progressive tilt to an inverted position altered the direction of nystagmus from up to down beating. In other patients tilt to prone or supine positions could enhance or abolish the nystagmus. Convergence movements also modified nystagmus amplitude. The results reconfirm that such nystagmus is provoked by otolith stimulation implying that current theory is, at best, incomplete.

4.

CSF Stress Test and CT Scanning in Secondary NPH

J. RUTKA, H. SCHUTZ, K. TERBRUGGE, M. CHUI and A. MONGUL (Toronto, Ontario)

While Idiopathic or Primary Normal Pressure Hydrocephalus (NPH) can be a readily reversible form of dementia, its diagnosis and treatment have been fraught with difficulties and disappointments.

We decided to study 38 patients with previous significant CNS pathology who were investigated for the subsequent development of symptoms and signs suggestive of NPH (secondary NPH). Four subgroups of patients were identified: Those with previous 1) hemorrhage 2) trauma 3) tumors and 4) infections of the CNS. All patients had a CSF stress test. Twenty-seven patients had an abnormal CSF stress test. Thirty-five patients had CT scans of which only twelve were suggestive of NPH.

Twenty-five of twenty-seven (25/27) patients with abnormal CSF stress tests were shunted. Twenty patients improved (80%), of which twelve patients (48%) were greatly improved. Follow up was two years on average. The complication rate was 3/25 (12%). Of the twelve patients with NPH by CT scan, ten improved following shunt insertion. However, ten patients in whom the CT scans were either normal or showed atrophy also improved. The CT scan, while specific when positive for NPH, is not a very sensitive or reliable test. 50% of patients with secondary NPH may go undiagnosed and untreated if only CT scan criteria are used.

Our results suggest that the CSF stress test is both a sensitive and specific investigation to help determine treatment for patients with NPH secondary to underlying CNS pathology. This is particularly true of patients with previous hemorrhages or trauma.

5.

Early Neurological Deterioration Following Spinal Cord Injury

K. MEGURO and C.H. TATOR (Toronto, Ontario)

During the period 1974-1979, 144 patients were admitted to the Acute Spinal Cord Injury Unit, Sunnybrook Medical Centre (SMC). Among them, 27 patients experienced early deterioration in neurological status. This group of patients (Group 1) was compared to the remaining 117 patients (Group 2) who either improved or showed no change in neurological status.

There was no difference between the two groups in age, sex, level of bony injury, type of fracture, incidence of other associated injuries, hypotension or systemic illness. Ten Group 1 patients developed neurological deterioration before admission to SMC. In eight of the ten, a compressive lesion was subsequently documented either by myelography or at surgery.

After admission to SMC, 17 patients experienced worsening of neurological status. In seven, a myelogram showed evidence of spinal cord compression and in three other patients, plain x-rays showed the presence of bony protrusion into the spinal canal. One patient deteriorated a few hours after the application of cervical traction. Other causes of deterioration in three patients included a postoperative epidural hematoma, cervical spondylosis, and vertebral artery occlusion. In three patients with deterioration, the myelogram was completely normal. In addition to these main features, difficult endotracheal intubation was felt to be a contributing factor for the progression of deficits in two patients.

In total, compression of the spinal cord was observed in 19 of the 27 patients (70%). Indeed, 16 of 20 patients (80%) who had myelography showed evidence of spinal cord compression. Thus, persistent compression of the spinal cord was the most common feature in patients who developed neurological deterioration. Early recognition of such compression and appropriate treatment was important in management of patients with acute cord injury.

6.

The Effect of Cervical Mobility on the Natural History of Cervical Spondylotic Myelopathy

M.P. BARNES and M. SAUNDERS (Yorkshire, England)

Compression of the cervical cord is a major factor in the pathogenesis of cervical spondylotic myelopathy. There is a variation, however, between the degree of compression and resulting degree of disability and it seems probable that factors other than simple compression may also play a part. Some authors feel that a high range of cervical mobility may contribute to the pathogenesis. We have made a retrospective study of 45 patients' who have been treated conservatively for cervical spondylotic myelopathy. A number of clinical and radiological parameters were analysed in an attempt to find factors that could be used to predict the long-term outlook for this condition. It was found that neither measurement of the degree of compression of the cervical cord nor any of the clinical variables could be used as predictive factors. However, those patients whose functional disability worsened over the follow-up period had a significantly higher degree of cervical mobility when compared to those whose disability had remained static. It is proposed that measurement of cervical mobility may help to select patients who are more likely to deteriorate and thus more likely to benefit from surgical intervention.

7.

Neurological Outcome and Spinal Evoked Potentials in A Spinal Ischemia Model: Transfemoral Balloon Occlusion of the Rabbit Aorta

M.K. CHENG, R.G. GROSSMAN, C. ROBERTSON and V. WILLIAMS (Edmonton, Alberta)

Occulsion of the abdominal aorta of the rabbit with a balloon catheter inserted transfemorally to a point distal to the renal arteries is a simple and reliable method of producing spinal cord ischemia. The electrophysiologic, neuropathologic and neurologic correlates of ischemia of progressively longer durations were studied with the goal of developing a reproducible model for central nervous system ischemia. The percent of animals developing paraplegia after varying periods of ischemia was 0% after 15 min., 20% after 17 min., 33% after 20 min., 86% after 25 min., and 100% after 60 min. of ischemia. The component waves of the spinal somatosensory evoked potential (SSEP) disappeared sequentially during ischemia in the following order: P_2, N_4, N_2 and N_1. After reperfusion the SSEP components returned in reverse order of their disappearance. The degree to which N_4, N_3/N_1 and P_2 returned, especially by 48 hr., correlated with the neurological outcome. After reperfusion, these three SSEP components returned to at least 30% of their control amplitudes by 120 min. and remained at least 30% at 48 hr. in the animals with a good neurological outcome. By 48 hr., all normal animals had at least 2 of the 3 components return to greater than 70% of their control amplitude while all paretic animals had at least one wave component and all paralyzed animals had at least two wave components deteriorate to less than 30% of their control amplitudes.

8.

The "Tethered Cord" Syndrome - Experience at the Children's Hospital of Eastern Ontario

E. VENTUREYRA, A. BADEJO, and L. IVAN (Ottawa, Ontario)

Between 1974 and 1982, 29 children underwent laminectomy and release of a tethered cord at CHEO. There were 16 males and 13 females. The ages ranged between 10 months and 15 years. The most common clinical presentation was foot deformity occurring in 15 patients. Back pain, motor deficit, scoliosis, neurogenic bladder and sensory deficit were other forms of presentation. The duration of these symptoms prior to surgery varied from a few months to more than 2 years. The follow-up period was between 2 months and 6 years with an average of 2.2 years. The investigations included x-rays of the spine, myelography and CT Scan of the spine.

In this series the commonest cause of this syndrome was a thick filum terminale (10). This was closely followed by chronic arachnoiditis (8). Other causes were disastematomyelia (7), lipoma (3), and hamartoma of the filum (1). All patients had laminectomy with release of the tethered cord. The best results were obtained in patients with back pain. They all improved. Progressive spinal and limb deformities arrested after surgical intervention. Progressive neurological deterioration arrested in some and improved in others after release of the tethered cord. Post-operative complications occurred in 3 patients: Transient urinary retention (1) and permanent neurogenic bladder (2). Intra-operative monitoring of urinary bladder and anal function were useful in preventing the above mentioned complications. CSF leaks and infections were not found in these series.

9.

Treatment of Parasomnias

J.D. PARKES (London, England)

Sleep walking, sleep terrors, nocturnal enuresis, nocturnal epilepsy, bruxism, head banging and sleep swallowing difficulties occur mainly during NREM sleep and are most frequent during the first third of the night. In contrast, cluster headache and painful erections occur during REM sleep. Nocturnal myoclonus, obstructive and central sleep apnoea occur during both REM and NREM sleep. The alteration of specific sleep phases by drugs; NREM sleep; (benzodiazepines, phenolethylamines); REM sleep; (protriptyline, clomipramine, fluoxetine); REM sleep atonia; (strychnine, clonazepam) is a possible approach to the treatment of parasomnias that is occasionally successful. Such treatment has been successful in the case of; sleep terrors (ephedrine, 30-60 mg nocte); nocturnal cluster headache (protriptyline, 10-30 mg nocte); nocturnal priapism (clomipromine, 25-50 mg nocte); nocturnal myoclonus (clonazepam, 2-4 mg nocte); obstructive sleep apnoea (protriptylene, 20 mg nocte).

In contrast, treatment of sleep walking (ephedrine, amphetamine, methylphenidate); bruxism and head banging (haloperidol, amphetamine) and nocturnal epilepsy (amphetamine, ephedrine) has been totally unsuccessful. In all cases, side effects, insomnia, daytime drowsiness, sympathomimetic or cholinergic effects occur and limit useful treatment.

10.

The Nature of the Hallucinatory Experiences of Prelingually Deaf Schizophrenics

E.M.R. Critchley (Preston, England)

The hallucinations of hearing schizophrenics are notable for the variety of auditory experiences which form a substantial part of Schneider's Symptoms of the First Rank in the diagnosis of schizophrenia. By contrast, visual hallucinations are rare (2-4%).

The hallucinations of schizophrenics with profound, prelingual deafness frequently include visual experiences, experiences using non-auditory modes of communication and hallucinations which they describe themselves as auditory. Their so-called auditory hallucinations simulate the auditory hallucinations of Schneider's first rank symptoms, occur more frequently than non-auditory communicated experiences and are afforded a peculiar primacy of importance by the deaf person. It is suggested that they arise in auditory comprehension pathways.

11.

Epidemiological Study of Patients with Multiple Sclerosis

D.A.S. COMPSTON, B.N. VAKARELIS, W.I. McDONALD, J.R. BATCHELOR and C.A. MIMS (London, England)

Epidemiological and serological comparisons were made in 64 patients with acute optic neuritis, 44 with other recent isolated demyelinating episodes, 69 with established multiple sclerosis in relapse, 98 normal controls and 66 individuals with other neurological diseases, in an attempt to identify differences in viral exposure. The expected high frequency of HLA-DR2 in the patients with demyelinating disease was matched by pre-selection of normal controls with this antigen and analyses restricted to individuals with HLA-DR2, DR3 or neither antigen were also performed. Patients with demyelinating disease had measles and rubella at a later age, reported mumps infection more frequently and had higher rubella antibody titres than controls, whereas measles HAI antibody was only increased in patients with optic neuritis. These results were entirely due to differences within the sub-group of patients and controls with HLA-DR2 and were not seen in individuals with HLA-DR3 or neither antigen, analysed separately; but no differences, depending on tissue type alone, were demonstrated by comparisons between these three genetic groups. The study suggests that the age at which susceptible individuals develop some childhood infections may, directly or indirectly, influence the subsequent development of multiple sclerosis and also provides evidence for heterogeneity in this disease.

12.

Chronic Relapsing Experimental Autoimmune Encephalomyelitis (EAE): Demonstration of surviving Oligodendrocytes in Chronically Demyelinated Lesions

G.R.W. MOORE, U. TRAUGOTT, and C.S. RAINE (Bronx, NY)

In the human demyelinating diseases (e.g. multiple sclerosis - MS), whether the oligodendrocyte or the myelin sheath represents the primary target has been long debated. In the present study, this question has been approached using established, chronically-demyelinated central nervous system lesions from Strain 13 guinea pigs with chronic relapsing EAE, an accepted model for MS. Lesions were studied by light microscope immunocytochemistry and electron microscopy. For the former, one micron epoxy sections were stained with anti-galactocerebroside serum by the peroxidase-anti-peroxidase technique. In normal white matter, myelin and oligodendrocytes stained positively. Within demyelinated plaques, oligodendrocytes also stained, together with myelin debris, with which they were sometimes associated. Astrocytes, axons and vessels were not labelled. Ultrastructurally, rounded cells containing 22 nm microtubules but no filaments, typical of oligodendrocytes, were seen closely applied to demyelinated axons. These cells frequently enveloped myelin fragments, appearances suggestive of phagocytosis. The findings support a similar conclusion in MS (Lab. Invest. 45, 534-546, 1981) that the myelin sheath, not the oligodendrocyte, is the primary target in autoimmune demyelination. (Supported in part by NS 08952 and NS 11920; and NMSS 1001-D-4. GRWM is a Fellow of the MS Society of Canada.)

13.

Local IgG Synthesis, Oligoclonal Banding and Complement Components in Multiple Sclerosis

H.J. SAGAR and E. SCHULLER (London, England)

Intrathecal synthesis of oligoclonal IgG is a frequent but not specific finding in multiple sclerosis (MS). We examined the CSF electrophoretic pattern on cellulose acetate and determined by electroimmunodiffusion the CSF concentrations of IgG, C1q, C3 and C4 of 210 patients with a normal CSF albumin concentration. (121 with MS and 89 with other neurological diseases, OND).

The CSF IgG concentration was normal in 49 cases (25 MS and 24 OND) of which two, both MS, showed oligoclonal banding. The remaining 161 (96 MS and 65 OND) had an elevated IgG concentration, indicating local IgG synthesis, and showed greater concentration of C3 and C4 also ($P<0.05$ - 0.005). In this group, patients with MS and OND did not differ in the total IgG concentration but MS patients had a higher frequency of oligoclonal banding (70%) than OND (34%; $P<0.001$) and, independently, lower concentrations of C3 and C4 than OND. ($P<0.005$). None of these differences was related to differences in serum concentrations.

We conclude that the immunopathology of MS differs from that of other neurological disorders studied.

14.

The Communication Disorder in Dialysis Encephalopathy: An Example of Thalamic Dysphasia

V.P. SWEENEY (Vancouver, B.C.)

The etiology, pathology and pathophysiology of dialysis encephalopathy remain an enigma. The author has examined and followed the majority of 32 cases occurring in one centre. The disorder of communication is unique and is different from the language disorders associated with lesions in the classical cortical speech areas. It is at first intermittent, later progressing to mutism. A hesitancy in producing words, the fresh appearance of deliberate or stuttering speech and telegraphic shortening of sentences are the initial features of the syndrome. Speech becomes increasingly dysfluent and effortful, with dyspraxic articulation, and syllables are replaced by inappropriate sounds or omitted. Prosody is altered with changes in melody, timing, pitch and loudness. Dysnomia, neologisms, perseveration and dyslexia later appear. Ability to read and verbal comprehension are maintained till the later stages of confusion and stupor. Seizures, myoclonus and dementia complete the syndrome.

Characteristic E.E.G. changes consisting of bisynchronous frontal dominant spike and slow wave complexes suggest an origin from subcortical grey matter. Both the E.E.G. abnormalities and speech disorder may temporarily be reversed by diazepam. One case has shown neuronal loss and gliosis confined to the thalamus. It is proposed that D.E. may represent an example of subcortical, likely thalamic encephalopathy.

Audiovisual examples of the communication disorder will be presented.

15.

Parkinson's Disease: Horizontal Saccadic and Smooth Pursuit System Dysfunction

J.A. SHARPE, O.B. WHITE, R.D. TOMLINSON and J.A. SAINT-CYR (Toronto, Ontario)

Saccadic and smooth pursuit functions were quantified in 14 patients with idiopathic Parkinson's disease and 10 control subjects. Eight patients had mild and six had advanced akinesia and rigidity. Eye movements were recorded by photoelectric infrared reflection and quantified by computer algorithms.

Saccades to predictable and random target steps had prolonged latencies. This saccadic akinesia increased as intersaccadic sampling time

decreased, suggesting that defective selection of targets for saccades of specific amplitude is responsible. Saccadic inaccuracy was manifested by abnormally frequent hypometric saccades. Very short corrective intervals (>10 msec) and accurate saccades to briefly (40 msec) flashed targets signified intact internal (non-visual) feedback of eye position errors. Saccadic peak velocities were reduced in advanced disease.

Smooth pursuit gain, the ratio of smooth eye movement velocity to target velocity, was significantly reduced while patients tracked sinusoidal targets at 0.25, 0.5, and 1.0 hz. Uniform reduction in gain at all target velocities within each frequency indicated dysfunction of the open-loop pursuit gain element, rather than abnormal acceleration saturation. Ocular motor deficits were more marked in patients with advanced skeletal motor dysfunction. We infer that damaged nigrostriatal circuits in Parkinson's disease impair control of the latency, velocity and amplitude of saccades and the gain element of smooth pursuit.

16.

Effect of 6R-L-erythro-Tetrahydrobiopterin (6R-BPH 4) Administration for Parkinsonian Disease.

H. NARABAYASHI, T. KONDO, T. NAGATSU, T. SUGIMOTO and S. MATSUURA (Tokyo, Japan)

The pharmacological feature of Parkinson's disease (PD) is now known as the result of deficiency of tyrosine hydroxylase (TH), the rate limiting enzyme for catecholamine metabolism, Dopa-decarboxylase (D-DC), dopamine-β-hydroxylase (DβH) and phenylethanolamine-N-methyltransferase (PNMT). Nagatsu et al. reported the deficiency of biopterin (BP), cofactor for TH, in this disease was parallel to the grade of lowering of TH activity. It is then suspected that deficiency of BP might result the reduction in activity of TH.

The authors intended to activate TH by administering 6R-BPH_4 for improving the parkinsonian symptoms in the various stage of the illness. Observations in five cases by single dose administration of 400 - 800mg will be reported and one demonstrative case with 16mm film. In general, the effects are diffuse on the various symptoms of the disease, i.e. akinesia, rigidity and tremor, and are moderate in grade, most markedly on akinesia. In the authors' experience, these effects were observed as similar to those obtainable by oral administration of 400 - 600mg L-Dopa. This treatment would offer the quite different approach in pharmacological therapy by activating the lowered enzyme activity and not by compensating the deficient metabolite as L-Dopa or L-*threo*-DOPS therapy.

17.

The Use of Low Dose Bromocriptine to Treat End of Dose Failure in Levodopa Treated Parkinson's Disease Patients: The Results of a Multicentre Study

J.D. GRIMES, D.B. KING, O.S. KOFMAN, P. MOLINA-NEGRO, A.F. WILSON and S. BOUCHARD (Ottawa, Ontario)

An open multi-centre trial involving 40 levodopa decarboxylase inhibitor treated Parkinson's disease patients (mean duration, 9 years) with daily mobility fluctuations, is reported. Thirty-two of the patients had clear end of dose failure, the others had less well timed fluctuations.

Bromocriptine (2.5mg b.i.d.) was increased by 2.5mg every 2 weeks to stable improvement or 30mg daily. An attempt was made to use the lowest effective bromocriptine dose. As bromocriptine was increased, small reductions in levodopa were made as required. Disease severity was scored on a 10 item disability scale (including a 0-4 fluctuation severity scale), daily mobility diaries were completed by the patients or relatives, and a minimum of 7 clinical assessments were done over the 26 week study.

The mean effective dose of bromocriptine was 22mg/day (50% of patients were on less than 20mg/day). Statistically significant improvement began at a mean dose of 12mg daily (week 8). Levodopa was reduced an average of 15%. There was an overall 33% improvement in total Parkinsonian disability score. Daily fluctuations were improved in 78% of patients (1 level, 48%; 2 levels, 30%). Side effects were minimal, the most frequent was transient nausea (15% of patients). Dyskinesias were not significantly reduced.

The slow introduction of low dose bromocriptine, combined with concomitant levodopa reduction, is an effective therapeutic maneuver for Parkinson's disease patients with daily fluctuations, particularly end of dose failure.

18.

The Assessment of Resting Tremor in Parkinson's Disease

L.J. FINDLEY, M.A. GRESTY and R. McCARTHY (London, England)

We present a method of assessing the magnitude and variability of resting tremor in Parkinson's disease and its responsiveness to drugs. The patient is observed in numerous short sessions which are spaced a.m. and p.m., and approximately 5 weekly, during increasing doses of dopaminergic agents, (typically l-dopa or bromocriptine). In each session the patient is seated in a standardized position and his behaviour and level of arousal are tightly controlled by presenting a series of tasks, in Latin square design, which stress particular aspects of cognitive function. The design includes a control condition in which the patient is unstimulated. During the tasks, tremor is monitored using accelerometers and its average magnitude is calculated as kinetic energy in the bands of the harmonics and fundamental frequency of the tremor(s). The results show that the tremor magnitude in patients whose tremor is responsive to drugs is reliably enhanced to consistent and high levels by certain types of tasks, e.g., "Stroop test" and colour patch naming. Tremor magnitudes under control condition or mental arithmetic were lower and more variable. Close proportional relationships were found between decreasing tremor magnitude under provocative tasks and increasing dosage of dopaminergic agents. The magnitude of intractable tremor in patients considered suitable for stereotaxis was not modified by tasks. The method provides a way of monitoring the pharmacodynamic response of tremor to drugs which correlates well with clinical and subjective assessment.

19.

Correlation Between Hippocampal Neurone Loss and Childhood Convulsions in Severe Psychomotor Epilepsy

H.J. SAGAR, J.M. OXBURY and J.T. HUGHES (Oxford, England)

Neuronal loss and gliosis in medial temporal lobe structures, particularly the hippocampus, is the commonest reported pathology in psychomotor epilepsy and has been associated with febrile convulsions in early childhood.

We examined the relationship between seizure history, hippocampal neurone loss and the presence of other focal pathology in 41 patients whose epilepsy was treated by en bloc anterior temporal lobectomy. The neuronal densities (cell counts per unit volume) of four hippocampal zones were measured and compared with normal values.

Of the patients with other focal pathology, 10 had gliomas, often unsuspected before surgery and 6 had other definite pathology (e.g. cortical malformations). Some of these had H3 (end-folium) neurone loss but only one had H1 (Sommer sector) neurone loss. In contrast 17 patients without other focal pathology had H1 neurone loss, many with H3 loss as well.

Early childhood convulsions were associated with neurone loss in H1 ($p<0.001$) but not H3. These convulsions were often unilateral and/or followed by a hemiparesis. Non-convulsive seizures were not correlated with cell loss in either zone.

We conclude that different mechanisms contribute to the cell loss in the H1 and H3 hippocampal zones.

20.

Homosexuality and Limbic Epilepsy

G.M. RÉMILLARD, F. ANDERMANN, L. DEMERS and J. BRADWEJN (Montreal, Quebec)

Sexual dimorphism in man was suggested by a study of sexual aura in temporal lobe epilepsy. This focussed our attention on the sexual behaviour of people with epilepsy.

Having observed a series of 9 patients whose behaviour suggested

homosexual orientation, we found that all were males with temporal lobe epilepsy.

This series was enlarged after we undertook a study of sexual orientation in 163 consecutive office and seizure clinic patients using a standard questionnaire. The survey yielded 93 responses from 48 males and 45 females. Among these, 6 males (12%) and 2 females (4%) were obligatory homosexuals. All but 2 of these patients also had temporal or limbic epilepsy. One woman had primary generalized cortico-reticular epilepsy and one male had unlocalized cerebral seizures.

Among the others who returned the questionnaire, 4 were predominantly heterosexual and only incidentally homosexual. Two males with temporal lobe epilepsy had always been asexual.

Psychosexual development was evaluated with the Bieber homosexual questionnaire in homosexual males with temporal lobe epilepsy. There was a striking history of over protection by the mother in the epileptic group as compared to non-epileptic homosexual controls. Sexual disinhibition was also a striking feature.

Epileptic dysfunction and seizure discharge in the temporal lobe and possibly hypothalamic changes induced by temporal discharges may be operant in the polarization of sexual orientation in man.

21.

CT Findings in Patients with Post-Stroke Seizures

S. BLACK, P.W. COOPER, J.W. NORRIS, V.C. HACHINSKI and E.E. KASSEL (Toronto, Ontario)

Seizures after stroke are a well-recognized, but little studied phenomenon. Previous series have yielded conflicting results and there has been no systematic study of these patients with CT. We therefore examined the CT scans of patients with post-stroke seizures to see if there were radiological features (such as lesion site and size) that characterized this subgroup.

827 patients with completed strokes consecutively admitted to our acute stroke unit were followed prospectively for 2 to 6 years. Seizures developed in 88 patients (77/635 with hemisphere infarcts and 11/71 with hemispheric hemorrhages). Our study bridged the CT era and 93 separate CT examinations were performed on 60 of these patients. 80% were scanned within two weeks of stroke onset. Scans of 55 patients were available for review and were compared to a randomly selected control group of non-seizure patients with completed strokes admitted to the same unit. The final diagnosis in the seizure group was infarct in 46 and hemorrhage in 9. CT scans were positive in 95%, and all lesions were hemispheric. Lesion size by predetermined criteria was as follows: large (>3 cm) in 89% of hemorrhages and 61% of infarcts; medium (1.5-3 cm) in 11% of hemorrhages and 23% of infarcts; small (<1.5) in 6% of infarcts.

Our preliminary analysis reveals that post-stroke seizures occur only in hemispheric strokes with a frequency of 12.5%, and that most arise from a sizeable parenchymal lesion (>3 cm) as assessed by computerized tomography.

22.

Focal Macrogyria: An Unusual Developmental Abnormality Associated with Intractable Seizures

T.G. STAUNTON, F. ANDERMANN, D. MELANCON, T.B. RASMUSSEN and A. OLIVIER (Montreal, Quebec)

Macrogyria is usually associated with severely abnormal brain development in infants. We have found radiological evidence of focal macrogyria in three adults with unusual and intractable seizures.

A 30 year old man of normal intelligence with megalencephaly and mild congenital right hemiparesis had partial motor seizures with secondary generalization. Continuous spiking was recorded from pre- and postcentral gyri, found to be of greater than twice normal width on C.T. scan and on surgical exposure.

A 30 year old woman of dull normal intelligence had a twenty year history of partial seizures starting with numbness in one or the other hand with secondary generalization; she had reflex induction of seizures by eating. Seizures were recorded from both frontocentral regions independently. Symmetrical parietal areas of macrogyria were demonstrated radiologically.

A 19 year old mildy retarded man with a 10 year history of complex partial seizures demonstrated bilateral independent spike activity with a predominance of epileptic activity from right posterior and mid-temporal regions. C.T. scan demonstrated focal macrogyria in right Rolandic and parieto-occipital cortical areas.

Macrogyria was not suspected in any of the patients and the diagnosis was made initially radiologically. The lesions were associated with unusually active epileptic discharge. The seizures were refractory to medication. These lesions represent a developmental abnormality affecting the cortex which may be quite focal in distribution and demonstrate interesting similarities with focal cortical dysplasia, as well as more diffuse congenital malformations such as lissencephaly, and represent part of a spectrum.

23.

Double-Blind Trial of Chronic Cerebellar Stimulation for Epilepsy

G.D.S. WRIGHT and D.L. McLELLAN (Southampton, England)

Twelve patients with severe intractable epilepsy of unknown cause were given a double-blind controlled trial of chronic cerebellar stimulation. The trials began only when each patient had resumed his pre-operative frequency of seizures.

Randomised phases of continuous stimulation, contingent stimulation and no stimulation were compared in each patient. Each phase lasted two months. CSF was taken pre-operatively and at the end of each phase to identify changes in neurotransmitter levels. 24 hour EEG tapes were recorded pre-operatively and twice during each phase of the trial to estimate subclinical epileptic activity.

This paper analyses the clinical findings and discusses the results of the CSF analysis and the 24 hour EEG recordings. A marked placebo response occurred and further studies on one patient confirmed a slight but consistent improvement related to stimulation, but there was no statistically significant clinical response to stimulation over the group as a whole.

24.

The Role of CT and NMR Stereotaxic Techniques in the Implantation and Mapping of Depth Electrodes for Epilepsy

A. OLIVIER, T. PETERS and G. BERTRAND (Montreal, Quebec)

A computer programme was written by T. Peters to use a series of CT scans carried out in stereotaxic conditions in patients undergoing placement of and recording with intracerebral electrodes.

Two modes of operation are described. The operator may select a distal target site and obtain the three-dimensional frame coordinates. Alternately, a set of frame coordinates can be given and the computer programme will display the depth electrode and its various recording sites. Ongoing epileptic activity can also be displayed.

The same programme is also being adapted for use with NMR techniques.

Its potential role in the biopsy and interstitial radiation of brain tumours will also be considered.

25.

Occult Encephaloceles and Temporal Lobe Epilepsy: Developmental and Acquired Lesions in the Middle Fossa

M.I. HYSON, F. ANDERMANN, A. OLIVIER and D. MELANCON (Montreal, Quebec)

We present three patients with partial complex seizures who were shown to have small and initially unsuspected encephaloceles of the middle fossa. All three had bitemporal independent interictal epileptic discharges. The side of origin of epileptic seizures in these patients was impossible to determine with surface electroencephalography.

One encephalocele was neoplasm related, another developmental, and the third a sequel of remote mastoidectomy. In all three, the bony defects were associated with herniation of cerebral tissue through dural defects.

All three have had no further partial complex seizures since operation.

A similar case has been described by Ruiz in the Spanish literature. There are also references to epilepsy as a complication of endaural herniation after remote mastoidectomy in the otolaryngological literature of the preantibiotic era.

These encephaloceles may elude discovery as the radiographic changes can be subtle. They represent yet another structural lesion associated with temporal lobe epilepsy and illustrate that small unilateral temporal lesions may be associated with bitemporal independent interictal discharges. They have lateralizing and localizing value.

26.

Surgical Treatment of Multilobe Seizures

F.B. MAROUN and J.C. JACOB (St. John's, Newfoundland)

In chronic seizure disorders, refractory to medical therapy, surgical treatment is usually restricted to a single lobe; e.g. temporal lobectomy in treatment of complex partial seizures. There is however, a group of cases where an intractable seizure disorder is consequent upon non-progressive pathologic lesions involving multiple lobes, and in which surgical therapy is rewarding. Our experience with 20 such cases is reviewed, the follow-up periods ranging from 1 to 15 years. The results of surgical therapy have been gratifying, since in several of these patients, in addition to seizure control, there has been remarkable improvement in behaviour.

It is suggested that surgical therapy should be considered at an early stage in this group of patients.

27.

Pharmacology and Efficacy of a New Anticonvulsant Drug (1,2-benzisoxizole, 3-methanesulfonamide)

B.J. WILDER AND R.J. PERCHALSKI (Gainesville, Florida)

CI-912 (1,2-benzisoxizole, 3-methanesulfonamide) is a new experimental anticonvulsant. It is currently being tested for efficacy and toxicity in adult epileptic patients who have refractory tonic clonic seizures.

Pharmacologic studies show the drug to be readily absorbed from the gastrointestinal tract. Peak plasma levels are achieved within 2 - 4 hours after dosing. The plasma half life has been shown to be 20 to 30 hours in epileptic patients receiving concurrently administered antiepileptic drugs. The drug is 50 percent protein bound in the plasma and is divided in a 1:2 ratio between the plasma and red blood cells. The CSF/plasma ratio is about 0.75. A major metabolite is an acetylated phenolic sulfonamide which is recovered in the urine as a glucuronide. None of the urinary metabolites appear in plasma.

The drug shows efficacy in generalized tonic clonic seizures. Preliminary data show the therapeutic index to be high with signs of toxicity appearing at plasma levels which are above 2 to 3 times the therapeutic range.

28.

Valproic Acid Teratogenicity: Evaluation of the Evidence

E. ANDERMANN and F. ANDERMANN (Montreal, Quebec)

Valproic acid (VPA) has emerged as a drug of choice in the treatment of primary generalized epilepsy. It is effective in controlling both major and minor clinical manifestations, and thus can frequently be used alone. Although it was known to be teratogenic in animals, there was no evidence for teratogenicity in man, despite its clinical use in Europe for twenty years.

A recent report by Robert from a birth defects monitoring system in Lyons showed that, of 72 infants born with neural tube defects, 9 were offspring of epileptic mothers who had taken VPA during pregnancy, 5 on monotherapy. Jeavons found 9 further neural tube defects, 3 on monotherapy.

Based on the Lyons data, the relative risk of spina bifida was calculated to be 20.6 (CDC, Altanta), resulting in an expected incidence of 1.2% vs. 0.06% in the general population. This is similar to the risk for siblings of patients with spina bifida.

In a small number of pregnancies on VPA, we found no evidence for major congenital anomalies. Several groups studying potential teratogenic effects of anticonvulsant drugs prospectively are reviewing their data regarding outcome of pregnancy on VPA. The combined data of the Berlin, Milan, Helsinki and Montreal groups will be presented.

Based on present evidence, infrequent myoclonic jerks or absence attacks alone do not justify changing to VPA in patients contemplating pregnancy. However, patients with major attacks who are not fully controlled on other medications may be tried or maintained on VPA, particularly since other anticonvulsants are also associated with an increased risk of major congenital malformations. Monitoring of alphafetoprotein in maternal serum and careful ultrasound examination, combined with amniocentesis when this appears warranted, should be carried out in pregnancies on VPA. As for other anticonvulsants, monotherapy and the lowest blood levels compatible with good seizure control should diminish the risk of birth defects.

29.

Influence of Intravenous Mannitol on the Permeability of Blood Tumor Barrier: Study with Positron

J.G. VILLEMURE, L. YAMAMOTO, T. OUCHI, C. THOMPSON and W. FEINDEL (Montreal, Quebec)

The blood brain barrier is a restricting factor in the delivery of certain drugs to cerebral pathological processes, such as infection or neoplasia. Using Positron Emission Tomography, we have studied quantitatively, the influence of I.V. Mannitol on the blood tumor barrier of 18 patients harboring a primary brain tumor. The study was carried out using 68 Gallium EDTA administered intravenously. Among 18 cases studied, there were 14 astrocytoma grade III and IV and 4 astrocytoma grade II. This study demonstrated an increased permeability at the tumor site with infusion of Mannitol. In 11 of 14 high grade gliomas, the increase was one of the order of 65 per cent and was considered statistically significant. ($P<0.001$) In four cases of grade II astrocytoma, there was also a significant increase of permeability of about 25 per cent brought on by the infusion of Mannitol which was also statistically significant. ($P<0.01$) With this technique of intravenous administration of Mannitol, there was no change observed in the permeability of the blood brain barrier in normal tissue.

This study demonstrates that the intravenous administration of Mannitol in concentration of 500 mg per kilogram of body weight increases the permeability of the barrier selectively at the site of the tumor and its marginal zone, without altering the normal blood brain barrier. This increased permeability is found to occur more extensively in high grade glioma and also to a lesser degree in low grade glioma. The administration of Mannitol, intravenously, prior or with the administration of an oncolytic agent, could likely increase the concentration of the oncolytic drug in the tumor selectively without increasing the risk of cerebral or systemic toxicity.

30.

Malignant Astrocytomas: Prognostic Factors

P.J. MULLER, K. SHIN, R.C. URTASUN and D. FULTON (Toronto, Ontario)

The records of 301 patients with malignant astrocytomas between the ages of 15 and 79 were reviewed. The median survival and the yearly actuarial survival rates were computed by the life table method. The mean age was 52.1 ± 13.8 years; 183 (60%) were male and 118 (40%) were female. Of the 113 (37%) who had astrocytomas grade 3 (AC3) the median post-operative survival was 329 days and the 1-yr. and 2-yr. actuarial survival rates were 45 and 24%, respectively. Of the 188 (62%) patients with astrocytomas grade 4 (AC4) the median survival was 259 days and the 1-yr. and 2-yr. survival rates were 30 and 11%, respectively. 119 (39%) patients were between the ages of 15 and 50 years and 182 were over the age of 50 years; the median survivals were 483 and 210 days, respectively and the 1 and 2-yr. rates were 58 and 32%, and, 21 and 4%, respectively. 262 patients received post-operative radiation (3000-6100 rads). Of these patients 48 were under the age of 50 years and had AC3, 42 were over 50 with AC3, 56 were under 50 with AC4 and 116 were over 50 with AC4. The median survivals were 1001, 238,

392, 238 respectively and the 2-yr. rates were 46, 10, 28, and 4%, respectively.

Patients with AC4 under the age of 50 survived longer than those with AC3 over the age of 50. The survival of patients over the age of 50 was independent of tumour grade. We conclude that age is a more important prognostic indicator than tumour grade especially in patients over the age of 50.

The effect on survival of tumour location, pre-irradiation Karnofsky score, degree of surgical resection, and total radiation dose will be reviewed.

31.

Superoxide Dismutase, Catalase and Glutathione Peroxidase in Human and Experimental Brain Tumors

R. DEL MAESTRO and W. McDONALD (London, Ontario)

The levels of superoxide dismutase (Cu-ZnSOD and MnSOD), catalase (CAT) and glutathione perioxidase (GPx) have been assessed in an experimental C_6 astrocytoma model in the rat and in human glial tumors. The C_6 astrocytoma cell line growing in vitro was inoculated intracerebrally, intramuscularly and subcutaneously into newborn rats and sampled at 19 days.

The C_6 astrocytoma cell line growing in vitro possessed high Cu-ZnSOD, high CAT and high GPx levels when compared to normal 19 day rat cortex. The implantation of this C_6 cell line into rat brain resulted in a decrease in Cu-ZnSOD but no change in the other enzymes studied. The passage of this cell line into subcutaneous back tissue resulted in a further decrease of Cu-ZnSOD. No changes were detected in the Mn-SOD levels when the tumor was grown in different anatomical sites. Tissue from human glioblatoma multiforme taken at operation demonstrated decreased levels of Cu-ZnSOD and increased levels of CAT when compared to adjacent normal cortex or white matter. A comparison of tumor edge and tumor centre disclosed further decreases in Cu-ZnSOD in the centre of these tumors. Both normal human cerebral cortex and normal rat cerebral cortex had a MnSOD/Cu-ZnSOD ratio of about 1. This ratio was 0.5 in the C_6 astrocytoma tumor and 1.5 in human glioblastoma multiforme. Our results demonstrate that the environment in which a tumor grows has an effect on the level of oxidative enzymes measured and that the levels of these enzymes are remarkably similar in the C_6 astrocytoma in the rat and human glioblastoma multiforme.

32.

CT Guided Stereotactic Brain Biopsies

O.N.R. Dold and J.D.S. McKEAN (Edmonton, Alberta)

From November 1982 through February 1983, twelve patients underwent C.T. guided stereotactic procedures using the G.E. 8800 C.T. scanner for target localization and the Brown Robert Wells C.T. stereotactic frame and guide. This system provides for millimeter accuracy and intraoperative confirmation of target coordinates. Procedures were done through twist drill holes under local anesthesia in most cases, some patients required general anesthesia. A rigid suction biopsy needle was used on most cases, while in recent cases fine bronchoscopy forceps were passed through a hollow probe. Ten patients underwent biopsy of deep hemispheric or midline lesions. One patient underwent biopsy and cyst aspiration, another underwent aspiration of a cyst associated with a previously irradiated tumor. Both attempts at cyst aspiration were successful. Of eleven brain biopsies the definitive diagnosis was obtained in nine. Eight had high grade astrocytomas, one had an oligodendroglioma. Two attempts to biopsy a pineal lesion failed to produce a diagnosis. A biopsy of a left occipital tumor was negative in a patient with a known right optic nerve glioma. The success rate of biopsies wnt of patients whose condition or location of lesion would preclude attempts at surgical resection.

33.

A Review of Brain Tumors in Newfoundland Children

S.K. ALI, E. WOOD, W. HENEGHAN, J.C. JACOB and F.B. MAROUN (St. John's, Newfoundland)

This report is a retrospective survey of 89 children diagnosed with brain tumors at the Dr. Charles A. Janeway Child Health Centre from 1966 to 1980.

In this group of patients, the mean age at diagnosis was 8 years, with the maximum number in the 5-10 year age group. The sex ratio was almost equal (male : female :: 1.2 : 1). The overall 5 year survival in our series was 43%, with a greater than 10 year survival of 38%.

This study is reported to highlight the findings that: 1) the incidence of brain tumors in Newfoundland (3.1 cases/100,000 children/year) appears higher than that reported in the U.S.A. and, 2) in contrast to other reported studies, supratentorial tumors are more common than infratentorial.

34.

Use of The Carbon Dioxide Laser in the Operative Management of Spinal Cord Tumors

N.A. RUSSELL, B.G. BENOIT and R. GOYAL (Ottawa, Ontario)

The introduction of surgical laser systems has provided an advance in neurosurgical instrumentation that is as intriguing as its apparent limitless potential. Carbon dioxide laser radiation is particularly applicable to neurosurgery because of the efficiency with which it is absorbed by biologic tissue. This allows pinpoint accuracy with minimal and localized tissue damage.

In this report we describe our experience with the use of the carbon dioxide laser in combination with the operating microscope in the surgery of seven cases of spinal cord tumors. These include five intradural extramedullary tumors (four meningiomas, one Schwannoma) and two intramedullary tumors (one glioma, one metastasis). The results in six were excellent. Tumor removal was complete and preoperative neurologic deficit was rapidly reversed. The one exception was the metastatic lesion.

We have found this technology to result in smaller operative exposures, reduced spinal cord traction, reduced manipulation by vaporizing tumor mass and efficient and complete vaporization of residual tumor attachments. Operating time was not reduced nor was there obvious decrease in intraoperative blood loss. This is related to certain deficiencies of the laser unit which we used and which have been corrected in the better units currently available.

We conclude this to be an efficient and safe means of removing tumors that are intimately attached to important neural tissue.

35.

Interstitial Radiation in the 9L Rat Brain Tumour: An Animal Model for the Study of Human Brain Tumour Therapy

M. BERNSTEIN and P.H. GUTIN (San Francisco, CA)

The advantages of interstitial irradiation over conventional irradiation for human brain tumours result from 1) the local placement of the source within the tumour, and 2) the radiobiological properties of low dose-rate radiation. These two factors combine to produce an enhanced therapeutic ratio between tumour and normal tissue. In an attempt to further define the potential utility of interstitial irradiation of human brain tumours, we studied the efficacy of this modality in a rat brain tumour model, alone, and in combination with BCNU.

F344 rats bearing intracerebral 9L gliosarcomas were treated with removeable Iodine-125 (I-125) radioactive implants in the tumour. Dosimetric calculations were based on the assumption of roughly spherical tumour growth. Interstitial radiation alone, to a minimum (peripheral) tumour dose of 6387 rad resulted in an increased life span (ILS) of 28% over that of control rats implanted with a dummy seed. An LD_{10} dose of BCNU (13.3 mg/kg) alone resulted in an ILS of 67%, whereas the combination of BCNU and interstitial radiation resulted in an ILS of 167%.

The pitfalls inherent in our model, and implications of the results regarding treatment of patients with malignant gliomas are discussed.

36.

Pharmacokinetic and Metabolic Studies in the Human Malignant Glioma with Positron Emission Tomography

Y.L. YAMAMOTO, M. DIKSIC, K. SAKO, W. FEINDEL, C.J. THOMPSON and J.G. VILLEMURE (Montreal, Quebec)

At the Montreal Neurological Hospital, using Positron Emission Tomography, 8 studies in patients with malignant glioma were performed

with ^{11}C-labelled BCNU. They underwent studies of the rCBF, regional cerebral metabolic rate of oxygen ($rCMRO_2$) and rCMRG1. The results show dissociation between the $cCMRO_2$ and rCMRG1 with 20% increase in the rCMRG1 in the tumor, as compared to the contralateral normal cerebral tissue and an 80% decrease in the $rCMRO_2$. The rCBF, at the tumor site, is generally reduced from 20 to 79%, as compared to the normal cerebral tissue. In the peritumoral edematous cerebral tissue, there is coupling phenomenon between $rCMRO_2$ and the rCMRG1.

The data obtained from this study suggest very abnormal glycolysis within the tumor. The highest rCMRG1, usually located in the distal portion of the tumor, appears to be related to the tumor activity and more viable portion. The same applied to the rCBF which appeared to be elevated in the peripheral portion of the tumor compared to its center.

The pharmacokinetic of ^{11}C-labelled BCNU shows, at the tumor site, an uptake which is proportional to the rCBF, soon after injection. The ^{11}C radioactivity is significantly higher in the tumor than the normal cerebral tissue after twenty minutes. The initial uptake of ^{11}C-labelled BCNU tumor appears to be proportional to the rCBF, but then, ^{11}C-labelled BCNU breakdown products seem to be proportional in uptake in the tumor site to the degree of blood-brain barrier disruption. This uptake of BCNU at the site of the tumor can be enhanced locally by the administration of intravenous Mannitol, as demonstrated in a few cases.

37.

Aneurysmal Bone Cyst and Osteoblastoma of the Cervical Spine

A. TRIAS, R. LEVEQUE and C. LUNEAU (Sherbrooke, Quebec)

Two teenagers have been followed for bony tumors histologically benign but affecting the superior cervical segment of the spine. The usual characteristics of the aneurysmal bone cysts and osteoblastoma have been recognized. A parallel can be established between these two epidural bony tumors in regards to the clinical presentation, the initial response after fixation, the difficulties in establishing a histological diagnosis, the various radio-diagnostic procedures used and their recent improvement, the multiplicity of surgical treatments performed, and the evolution after respectively eight years and three years of follow-up.

This comparison brings us to recognize: first the usefulness of a vigilant clinical observation because of rapid neurological deterioration until reassurance that the bone graft is taking over the tumor; second the role of CT scan studies in evaluating extension of the tumor in the vertebrae, third the necessity of approaching the tumor from 360 degrees beginning with a posterior exploration and fixation followed by a bilateral antero-lateral exposure.

Embolization and X-ray therapy are by no mean curative procedures. The success of the excision is parallel to the radiological evolution of the bone graft.

38.

Visual Fading Due to a Posterior Cerebral Lesion

C. KENNARD and K.H. RUDDOCK (London, England)

Patients with lesions of the parieto-occipital region have previously been reported as having a variety of qualitative visual field defects. We present a psychophysical study of a 33 year old woman with a metastasis from a malignant melanoma in the left parieto-occipital region, who presented with fading of vision in her right hemifield.

Under voluntary fixation, the perceived image of objects in the right hemifield blurred rapidly with consequent loss of visual discrimination. Thus the subject made gross errors in matching the size or stereoscopic localisation of two grating patterns placed one in either half field, and she was unable to identify correctly any of the Ishihara colour test plates. When the various tests were repeated with transient presentation of the stimuli (i.e. flashed), however, her performance in each case was essentially normal. Experiments with moving gratings established that her detection threshholds were normal for stimuli undergoing temporal changes at frequencies above 1 Hz, whereas at lower frequencies threshholds were significantly elevated relative to those for normal vision.

Although it is known that stabilisation of the retinal image reesults in a similar blurring it is unusual for the phenomenon to result from a cerebral lesion. It is concluded that the parieto-occipital lesion selectively suppressed visual function in a channel responsible for sustained responses and that the surviving transient channels possess normal visual discriminative capacity.

39.

Studies of the Pathogenesis of Dietary Migraine

R. PEATFIELD, R.G. PETTY, F.C. ROSE, T.G. MERRETT, J. LITTLEWOOD, V. GLOVER and M. SANDLER (Leeds, London, England)

About 19% of the patients with common or classical migraine attending the Princess Margaret Migraine Clinic report that headaches can be precipitated by cheese, chocolate and citrus fruit. These foods are immunologically dissimilar, but it has been suggested that Tyramine may be a causative agent. Dietary patients do not have lower levels of platelet monoamine oxidase, but we have demonstrated that levels of phenol-specific phenol-sulphotransferase are significantly lower in the dietary patients. We are now exploring the inheritance of dietary sensitivity.

Studies of the pressor effect of intravenous and oral tyramine have shown no differences between migraine patients and controls, nor between dietary and non dietary patients. The male subjects with the lowest MAO values were a little more sensitive to intravenous tyramine. The dietary patients, however, were significantly more likely to develop a headache after the tests.

We have also studied IgE and IgG4 titres in 74 dietary and 45 non dietary migraine patients and have found no differences between them, either in total antibody levels or in food related antibodies. Levels of total IgE in cluster headache patients, however, were significantly higher.

We speculate, therefore, that a phenolic compound in these foods induces headaches by a mechanism that may be independent of catecholamine release.

40.

Levels of Enolase and Other Enzymes in the Cerebrospinal Fluid as Indices of Pathological Change

W.R. TIMPERLEY, J.A. ROYDS, J.A.B. DAVIES-JONES and C.B. TAYLOR (Sheffield, England)

The glycolytic enzyme enolase has three immunologically distinct subunits designated α, β and γ. Five types of isoenzyme, the three homodimers ($\alpha\alpha$, $\beta\beta$ and $\gamma\gamma$) and two hybrids ($\alpha\beta$ and $\gamma\gamma$) have been demonstrated. The $\alpha\alpha$ isoenzyme is the commonest form and occurs in most tissues; $\beta\beta$ enolase is found predominantly in muscle; whereas $\gamma\gamma$ enolase is found in neurons and cells of the APUD system. In this study the activities of total enolase, aldolase, pyruvate kinase, lactate dehydrogenase and creatine phosphokinase were measured in the cerebrospinal fluid of patients presenting with a range of disorders of the nervous system. The results from a series of patients undergoing myelography were used as controls. An assessment was made of the relative merits of these five isoenzymes as markers of brain damage. Enolase was the most sensitive marker of pathological change and was the only enzyme raised in the C.S.F. of patients with low grade astrocytomas. Alpha and gamma enolase were assayed in the C.S.F. of a further series of patients and these isoenzymes proved sensitive markers of white-matter and neuronal damage respectively.

41.

The Role of Hyperbaric Oxygen and Lidocaine HCL for Protection in Global Cerebral Ischemia

M.J. KENDALL, F.A. DURITY and M. LEPAWSKY (Vancouver, B.C.)

In a series of experiments using the Mongolian gerbil, lidocaine HCl - a membrane stabilizer and hyperbaric oxygen were tested as potential protective agents in global cerebral ischemia.

The experimental animals, all subjected to reversible carotid occlusion of 12 minutes duration under ketamine (50 mg/Kg) anaesthesia were divided into 4 groups: Group I (N = 12) received no treatment, Group II (N = 9) and Group III (N = 8) were treated with 1.5 atmospheres of

hyperbaric oxygen for 40 minutes, starting at $3^1/_2$ - 5 minutes (early HBO) and $5^3/_4$ - 16 minutes (late HBO) respectively, postclip release. Group IV (N = 10) received 10-15 mg/Kg of 1% lidocaine intravenously, starting at 3 - $5^1/_2$ minutes postclip release. Hyperbaric oxygen controls (N = 4) and lidocaine controls (N = 4) were included. One week later the animals were sacrificed by perfusion-fixation.

Ischemic cell counts of 16 identical high power fields of layer 3 cortex, in each brain, were performed. Group II (early HBO) compared to Group I showed significant protection ($p<0.03$). Groups III and IV compared to Groups I and II showed significantly more damage ($p<0.001$).

We concluded that in this model, early administration of hyperbaric oxygen was beneficial, but late administration of hyperbaric oxygen and lidocaine HCl may even be deleterious.

42.

A Standardized Neurological Assessment in Acute Stroke

R. COTE, J. NORRIS, V. HACHINSKI and B. SHURVELL (Montreal, Quebec)

Although stroke constitutes the major disabling neurological problem in Canada, no reliable standardized method for its clinical monitoring exists. This communication presents such a grading system and preliminary results on its clinical reliability.

This system contains nine simple clinical items which can be regrouped in two sections based on the presence or absence of a comprehension defect. If a patient has no comprehension defect he is scored in section A_1 which is comprised of 6 items: 1) Orientation 2) Speech 3) Facial weakness 4) Proximal arm weakness 5) Distal arm weakness 6) Leg weakness. However, if a comprehension problem exists, section A_2 is used. This section contains 3 items: 1) Facial weakness 2) Arm weakness 3) Leg weakness. Each item is then divided into different grades reflecting various degrees of neurological deficit (i.e., leg weakness: none, mild, significant, total). This scoring system was tested in a group of 33 patients with varying degrees of neurological deficit secondary to cerebrovascular disease. All deficits were graded within a few hours by 3 or 4 observers with different medical training i.e., one neurologist, one neurology resident, two nurses. Each rater took between 5-10 minutes to score one patient. Statistical analysis of the first 110 assessments showed a very high degree of reliability (Cronbach's alpha > 90%) and also a high degree of association between observers in grading deficits (Somer's D and Kendall's Tau b tests).

This standardized neurological assessment permits early detection of changes in neurological status and can serve as an objective evaluation of stroke patients participating in multi-center trials.

43.

The Effect of Steroids on Mitochondrial Function During Global Cerebral Ischemia

R. DEL MAESTRO and J. MacKINNON (London, Ontario)

It has been hypothesized that the influx of extracellular Ca^{2+} during cerebral ischemia results in the activation of phospholipase activity and subsequently mitochondrial membrane injury. Corticosteroids have been shown to induce the formation of a polypeptide, macrocortin, which experimentally inhibits phospholipase activity. If the influx of Ca^{2+} induces phospholipase activity which results in mitochrondrial injury then pretreatment with corticosteroids by decreasing phospholipase activation should ameliorate injury.

Global cerebral ischemia of 15 minute duration in the rat is associated with a 45 - 50% decrease in mitochondrial state 3 and a 20 - 30% decrease in mitochondrial state 4. Pretreatment of these animals with dexamethasome (1 and 10 mg/kg/day) or methyl prednisolone (60 mg/kg/day) for 48 hours before inducing cerebral ischemia did not alter the expected decreases in state 3 and state 4. In our global cerebral ischemia model corticosteroid pretreatment did not significantly ameliorate mitochondrial injury.

44.

C S F Enolase in Cerebral Infarction

G.A.B. DAVIES-JONES, E. HAY, J.A. ROYDS, N.A. LEWTAS, W.R. TIMPERLEY and C.B. TAYLOR (Sheffield, England)

Enolase is a dimeric enzyme catalysing the interconversion of 2 - phospho - D - glycerate and phosphoenolpyruvate in the glycolytic pathway. Five isoenzymes are known, the three homodimers $\alpha\alpha$, $\beta\beta$ and $\gamma\gamma$ and two hybrids $\alpha\beta$ and $\alpha\gamma$. Gamma enolase is found in neurones of the central and autonomic nervous systems and in cells of the APUD system, and is otherwise known as "neurone-specific enolase". Alpha enolase is more widely distributed, and within the nervous system is found in glial cells but not in neurones.

In this study α and γ enolase were measured by a radioimmunoassay technique in the C.S.F. of patients with strokes, and these results were correlated with the volume of infarction, as assessed by C.T. Scanning.

In the patients studied, there was a positive correlation between the levels of α and γ enolase in the C.S.F. and the volume of the infarct.

Cerebrospinal fluid enolase estimation may prove to be a sensitive indicator of the extent of cerebral infarction and of the proportions of grey and white matter involvement.

45.

Carotid Bruits and Heart Attacks

B.R. CHAMBERS and J.W. NORRIS (Toronto, Ontario)

Although carotid bruits are an accepted risk for stroke, it is not generally appreciated that there is a greater risk for myocardial infarction. Acute myocardial infarction is the commonest cause of death complicating carotid endarterectomy and in patients with asymptomatic cervical bruits and transient ischemic attacks, as well as those surviving stroke.

Over a 19 month period, 279 patients with asymptomatic cervical bruits were entered into a prospective follow-up study and evaluated clinically and by carotid Doppler. The prevalence of ischemic heart disease was 50%. During the course of the study 8 patients developed transient ischemic attacks but there were no spontaneous strokes. However, 12 patients developed myocardial infarction which was fatal in 4. Another died from rupture of an abdominal aortic aneurysm. In 14 patients undergoing carotid endarterectomy, 2 experienced operative myocardial infarctions.

We conclude that myocardial infarction, rather than stroke, represents the greatest threat to patients with asymptomatic cervical bruits. This has serious implications in appraising the risks of carotid surgery in both symptomatic and asymptomatic patients.

46.

Asymptomatic Neck Bruits - A Doppler Analysis

M. VILAGHY and W. SO (Ottawa, Ontario)

One hundred and fifty-two (152) bruits were assessed in 79 neurologically asymptomatic patients by continuous wave Doppler. On the basis of auscultation the bruits were categorized as "carotid" (80), "vertebral" (10), "subclavian" (53) and "innominate bifurcation" (9). 73 (91.3%) of the carotid bruits, 9 (90%) of the vertebral bruits and 47 (88.7%) of the subclavian bruits were found to be due to arterial occlusion, stenosis or, infrequently, due to nonstenosing plaque. Eight asymptomatic bruits were caused by increased flow velocity either as a generalized pattern (4/8) or due to occlusion elsewhere (compensatory flow increase: 3/8) and vertebral steal (1/8). Similar factors could explain 16 bruits (10.5%) where no ultrasound detectable abnormality was found.

The "innominate bifurcation" bruit group appeared to be a distinctly different one - characterized by the following features: 1. Location: Right sternoclavicular are; 2. Low (maximum 2/6) intensity; 3. Medium or medium-low pitch; 4. Younger patients (mean age 39.8 years); 5. No (8/9) or minimal lesion (35% or less stenosis in 1/9) by Doppler.

No correlation was found between the intensity of a bruit and the degree of stenosis. High pitched bruits were more pathognomonic of

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stenosis than low pitched bruits. "Rumbles" were usually not the sign of arterial stenosis. Venous bruits can be recognized by phase delay and disappearance during mild compression of the appropriate jugular vein.

Summary:

1. Asymptomatic arterial bruits are sensitive indicators of vessel pathology.
2. Right sternoclavicular bruits especially in young patients - are almost always harmless.
3. The pitch and location of a bruit is more important than its intensity.
4. The discovery of a neck bruit is an indicator for Doppler or other ultrasound assessment of the neck arteries.

47.

Carotid-Cavernous Aneurysm: Management in Sixty Cases

J.M. VASCIK, G.G. FERGUSON, C.G. DRAKE, S.J. PEERLESS, J.P. GIRVIN, A.J. FOX and F. VINUELA (London, Ontario)

Sixty patients with carotid-cavernous aneurysm have come under our care. In 27 patients the cavernous aneurysm was treated. This report describes the evolution of our management of these cases. Nineteen of the 27 patients undergoing treatment had giant aneurysms (>2.5 cm). Two of these patients had bilateral giant aneurysms. Twenty-one patients presented with cranial nerve palsies, 2 with subarachnoid hemorrhage, 1 with a carotid cavernous fistula, and 3 were asymptomatic.

Thirteen cases were treated with Selverstone clamp occlusion of the ipsilateral internal carotid artery (ICA), 7 were treated with transfemoral balloon occlusion of the ICA, and 7 were explored intracranially. Currently, angiographic cross-compression studies and cerebral blood flow studies with and without carotid compression are used to evaluate the safety of carotid occlusion. Two complications occurred with ICA occlusion. One patient suffered a major stroke secondary to embolic occlusion of the middle cerebral artery, and another developed complete ophthalmoplegia with severe trigeminal pain hours after the occlusion. Patients with a complete ophthalmoplegia at the time of surgery appear to have a poor prognosis for recovery, while patients with an incomplete ophthalmoplegia may recover completely.

The majority of carotid-cavernous aneurysms are discovered incidentally, and require no treatment. Symptomatic lesions may benefit from treatment. Our currently preferred method of treatment is transfemoral balloon occlusion of the ICA, if hemodynamic tolerance is certain. Preliminary bypass surgery as a routine measure is not required.

48.

Basilar Fenestration Aneurysms

G.G. FERGUSON, D.C. BRETT, C.G. DRAKE and S.J. PEERLESS (London, Ontario)

Fenestration, or partial duplication, of the basilar artery is an unusual congenital anomaly occurring immediately distal to the vertebral junction. Sporadic examples of subarachnoid hemorrhage from aneurysms at this location have been reported. Nine cases of basilar fenestration aneurysm have been seen in our centre. In each case the aneurysm arose at the proximal carina of the fenestration, which supports the hemodynamic theory of aneurysm formation. The pathogenesis, the distinctive radiological features, and the surgical management of these unique aneurysms will be reported.

49.

Anticoagulation and Incidental Intracranial Aneurysms

R.G. PERRIN, J. LEWIS and W.S. TUCKER (Toronto, Ontario)

The increasing frequency with which incidental asymptomatic intracranial aneurysms are being discovered has generated some discussion concerning the optimal management of these lesions.

A rational approach to the treatment of incidental aneurysms must weigh the risk of surgery versus the risk of rupture and related consequences. Most surgical series describing the obliteration of incidental intracranial aneurysms report a morbidity of three to four per cent (without mortality). Generally accepted risk factors for aneurysm rupture include age, size of the lesion, and concomitant disease. The degree to which systemic anticoagulation might contribute to the risk of incidental aneurysm rupture and related consequences, has not been described.

We have managed four patients who had incidentally discovered asymptomatic intracranial aneurysms and concomitant compelling reasons for systemic anticoagulation. The rationale for surgical treatment in these cases will be discussed.

50.

Spontaneous Acute Arterial Subdural Hemorrhage

M. McDERMOTT, J.F.R. FLEMING, W.S. TUCKER and R.G. VANDERLINDEN (Toronto, Ontario)

Five patients are presented who developed the sudden onset of violent, severe headache. There had been no recent trauma, and all patients had been previously healthy. Neurologic deficits and altered consciousness ensued in some of the patients. The clinical picture was similar to that seen in acute subarachnoid hemorrhage, but all five patients proved to have acute subdural hematomas. A few similar cases have been recorded in the literature.

The source of the hematoma was identified as a bleeding cortical artery, located near the sylvian region, in four of our five patients. Three possible anatomical situations may predispose a cortical artery to "spontaneous" rupture. 1) A "knuckle" of the cortical artery protruding through the arachnoid, as suggested by Drake. 2) An adhesion between the adventitia of the cortical artery and the adjacent arachnoid as demonstrated by O'Brien, Norris and Tator. 3) The presence of an arterial "twig" branching from a cortical artery at right angles, traversing the subdural space, and anastamosing with dural vessels.

In each situation, the artery is probably torn by a sudden movement of the brain occurring during a vigorous head movement, a movement not severe enough to be considered as trauma, and not remembered by the patient.

51.

Microlumbar Discectomy: A Prospective Study

H. SCHUTZ, C.P.N. WATSON and A. MONGUL (Toronto, Ontario)

The value of applying microsurgical techniques to classical laminotomy and discectomy in the treatment of intractable sciatica, remains a controversial subject.

This paper describes the results of a series of 100 patients undergoing discectomy using microsurgical techniques over a 2 year period. This report differs from previous publications in that i) a prospective and consecutive group of 100 patients with signs of intractable root tension is studied, ii) complete follow up of physical and psychological factors at 3 and 12 months are obtained through an independent pain clinic (Smythe Pain Clinic, TGH), iii) a number of causal/explanatory factors (165 per patient) describing patient and treatment characteristics is assessed using logistic discriminative methods.

A computerized analysis of the pertinent causal and explanatory factors is presented in detail. The critical aspects of the microsurgical technique are as follows: i) minimal paravertebral muscle retraction; ii) preservation of all extradural fat, iii) minimal retraction of the nerve root, iv) thorough removal of the intervertebral disc material. 97% of patients are mobilized on the day of surgery, 40% are discharged on the 1st or 2nd post-operative day, 50% are discharged on the 3rd or 4th post-operative day. At 1 month, 3 months, 12 months there is complete relief of back pain in 71%, 83%, 87% of patients respectively; complete relief of leg pain in 89%, 95%, 98% of patients respectively; return to previous employment in 51%, 76%, 96% of patients respectively.

Microlumbar discectomy is a safe and effective treatment of patients with intractable sciatica.

52.

Intracranial Abscess. The Newfoundland Experience

W.O. GITTENS, F.B. MAROUN, M. FARIDI and A.G. CASSON (St. John's, Newfoundland)

Twenty-five cases of intracranial abscesses, 18 adult and 7 paediatric, seen between 1965 and 1983 were reviewed. Ages range between new-

born and 69 years; the peak incidence being between ages 16 and 20 years.

The commonest sources of infection were, otitis, mastoiditis or sinusitis (32%), head injuries (16%), meningitis (8%). The commonest presenting symptoms were; decreased level of consciousness (60%), headaches (56%) and various forms of focal neurological deficit (44%). Predominant organisms were pneumococcus, haemolytic streptococcus and proteus. Sites were fronto-temporal (56%), occipital (12%), cerebellar (16%), subdural and epidural (20%).

Total excision of the abscess was performed in 18 patients and drainage in 3. There were 3 deaths in the surgically-treated group. In 4 patients the diagnosis was made at autopsy.

The overall mortality was 28%. The surgical mortality was 14.3%. In this small series, as reported by others, mortality improved in recent years. Between 1965 and 1970 mortality was 71% (5 of 7 patients) whereas between 1971 and 1975, 1 of 3 patients died (33%); 1976-1980, 1 of 8 patients died (12.5%) and from 1981 - 1982, only 1 of 7 patients died (14.3%).

53.

Computer Implementation of the Glasgow Coma Scale

M. SCHWARTZ, M. STEGA, L. OLTON and K. MILHOLLAND (Toronto, Ontario)

Automated data-gathering in the Neuro-Intensive Care Unit has lagged behind developments in cardiovascular intensive care because of the difficulty in simplifying the assessment of consciousness and neurological observations to the point where they are adequately represented by numeric scales. With the advent of the Glasgow Coma Scale (Teasdale, Jennett - 1974) and the wide acceptance of it and other numeric scales, this problem has been obviated. We report the first computer implementation of the Glasgow Coma Scale in Canada which has been in use at Sunnybrook Medical Centre for two months. The data are entered into the computer at bedside terminals by means of an interactive program that invites the intensive care nurse to respond to a series of questions regarding the elements of the Glasgow Coma Scale, vital signs and neurological observations, usually by one or two key strokes. The intensive care nurses have no formal training in typing or computers other than the orientation provided by the suppliers of the equipment. Their acceptance of the system has generally been good. The printout is produced automatically and will shortly completely supplant the hand-written record. As the numeric representation of the elements of the Glasgow Coma Scale is available to the host program of the system, these observations can be plotted against automatically collected parameters such as intracranial pressure measurement allowing correlations to be more easily seen.

54.

The Effect of Patient Positioning upon Cerebral and Cardiovascular Parameters Following Brain Injury

Q.J. DURWARD, A.L. AMACHER, R.F. DEL MAESTRO and W. SIBBALD (London, Ontario)

The effect of varying degrees of head elevation (by flexion in bed at the hips) upon cerebral and cardiovascular parameters was measured in 11 severely brain injured patients. Thirty-one separate sets of recordings were taken of the intracranial pressure, systemic arterial pressure, cardiac output, pulmonary artery wedge pressure, arterial and mixed venous blood gases, and heart rate at 0^0 (patient flat) and at 15^0, 30^0 and 60^0 of head elevation. Cerebral perfusion pressure and cardiac index were calculated from the recordings.

Results indicate that head elevation of 15^0 and 30^0 provide the lowest intracranial pressure (reduced 4.5 ± 1.6 mmHg and 6.1 ± 3.4 mmHg respectively) while maintaining the cerebral perfusion pressure and cardiac output ($P<.001$). Elevation of the head to 60^0 results in a slightly higher intracranial pressure (3.8 ± 9.3 mmHg). However, a significant drop of 7.9 ± 9.3 mmHg in the cerebral perfusion pressure ($P<0.02$) and a drop of $0.25 \pm .28$ litres per minute per meter^2 in the cardiac index ($P<0.01$) occurred at 60^0 of head elevation. No significant changes in the pulmonary artery wedge pressure, arterial oxygen content or heart rate were encountered.

This study demonstrates that a moderate degree (15^0 or 30^0) of head elevation provides a consistent reduction of intracranial pressure yet does not compromise other parameters of cardiac function. Lower (0^0) or higher (60^0) of head elevation may be detrimental to the patient.

55.

Outcome of Severe Head Injury in Children - Is 6% Mortality Realistic?

R.P. HUMPHREYS, R. JAIMOVICH, E.B. HENDRICK and H.J. HOFFMAN (Toronto, Ontario)

Current treatment programs for head-injured patients have been reviewed carefully during the past five years. The purpose of this review will be to analyze the outcome of 95 children with "severe head injury", who entered a multi-modal treatment program in an intensive care unit, at the Hospital for Sick Children (HSC). All children had initial Glasgow Coma Score (GCS) of 7 or less.

The factors which have been strongly related to outcome of treatment in severe head trauma have been identified as age of patient, aspects of coma, autonomic abnormalities and intracranial hematoma. The only series reported to date concerning the outcome of severe head trauma in children, is that from the Children's Hospital of Philadelphia (CHOP), where a mortality rate of 6% contrasts remarkably with the much higher rate quoted in the predominantly adult reports. The HSC management protocol is essentially that used in CHOP and in other experienced head injury facilities.

Outcome is more reliably predicted by the initial GCS, than by intracranial pressure measurements, or CT revelations. The mortality is 40%, and is a reflection of the referral pattern, initial triage and transport mechanisms to our hospital, with 90% of children admitted within 12 hours of trauma. The mortality rate is much more comparable to that quoted in adult series and that recently reported from other children's hospitals, than the CHOP rate.

56.

The Heart Disease of Friedreich's Ataxia: A Clinical and Electrocardiographic Study of 115 Patients with an Analysis of Serial Electrocardiographic Changes in 30 Cases

A.E. HARDING and R. LANGTON HEWER (Bristol, England)

115 patients with carefully defined Friedreich's ataxia were assessed clinically and electrocardiographically for evidence of heart disease. Cardiac symptoms, of which dyspnoea and palpitations were the most frequent, occurred in less than 30 per cent. Abnormalities on clinical examination were present in a similar proportion; harsh systolic murmurs, ventricular hypertrophy and added heart sounds were the commonest of these. Cardiac failure and persistent arrhythmias were rare and occurred late in the evolution of the neurological disease. Two patients presented with heart disease prior to developing neurological symptoms. Cardiac signs and symptoms were uncommon in patients without electrocardiographic (ECG) abnormalities. About two-thirds of the cases had definitely abnormal ECG recordings. The characteristic finding was of widespread T-wave inversion with ventricular hypertrophy.

Serial ECGs, recorded over periods of up to 32 years, were available in 30 cases. These suggested that ECG abnormalities may develop in patients with Friedreich's ataxia at any time up until 20 years after onset of neurological symptoms. In four patients initial ECG abnormalities had either improved or disappeared on subsequent recordings.

57.

Central Neurofibromatosis

D.C. THRUSH and S. HUSON (Plymouth, England)

Six members in two generations of a family with central neurofibromatosis were reviewed. Three had been diagnosed initially as having atypical, familial otosclerosis.

In addition to bilateral acoustic neuromas, the hallmark of central neurofibromatosis, five of the six had other brain or spinal cord tumours.

Three have died from the effects of their neuromas or from surgery; one committed suicide shortly after the death of his mother because of increasing disability; two are still alive, though severely handicapped.

All reviews have been retrospective. Surgery has usually been undertaken when the acoustic neuromas were large with consequently a poor prognosis. Potentially affected members of this family are now being followed regularly in the hope that regular clinical, radiological and audiological screening will detect acoustic neuromas at an early stage, so that with improved operative techniques the neuromas may be removed without damaging the facial nerve.

58.

British Multicentre Trial of Plasma Exchange (PE) in Acute Inflammatory Polyradiculoneuropathy

R. GREENWOOD, R.A.C. HUGHES, J. NEWSOM-DAVIS, S. ASLAN, R.B. SCOTT, A.N. BOWDEN, D.W. CHADWICH, D.L. McLELLAN, P. MILLAC, N.S. GORDON and P. ARMITAGE (London, England)

Effective treatment of AIP remains supportive. The relative importance of humoral and cellular allergic mechanisms is uncertain. Reported benefits of PE in uncontrolled studies may merely reflect spontaneous recover. We undertook a randomised controlled trial of PE in AIP, having deduced from our previous prednisolone study that worthwhile benefit would be detected using only 15 patients in each group.

Patients fulfilling established criteria were accepted with these exceptions: (a) previous attack of AIP; (b) improving; (c) able to walk unaided; (d) immunosuppressive treatment during the previous year; (e) neurological symptoms for more than 30 days; (f) positive for hepatitis B surface antigen; (g) unavailable for follow-up over one year; (h) aged under three years; (i) pregnant; (j) suffering from severe concurrent medical disease.

Initial and subsequent assessments were made using disability scores previously established. Treatment comprised five daily exchanges starting immediately on entry, replacing 5 l of plasma per kg body weight during each exchange. Both groups received normal supportive care. Other immunosuppressive treatment was avoided unless deterioration continued for more than six weeks.

Thirty patients were entered by March 1982. Preliminary analysis at 2, 4, 12, 24 and 36 weeks after entry showed no significant benefit from treatment.

59.

Myasthenic Syndrome of Eaton-Lambert - Response to Therapy of Small Cell Cancer of the Lung

J.G. HUMPHREY, G.H. CLAMON, W.K. EVANS and F.A. SHEPPERD (Toronto, Ontario)

The myasthenic syndrome (MYS) occurs in 6% of patients with small cell carcinoma of the lung (SCCL). Recent reports indicate that a circulating IgG antibody may produce defective acetylcholine release at the nerve terminal in MYS. Guanidine, immunosuppressive therapy and plasma exchange may be effective in improving MYS. The course and response of MYS with effective anti-neoplastic therapy of the SCCL are less clear from present reports.

5 patients with the MYS have been studied - 4 male, 1 female; age 50-73 years. All had proximal muscle weakness and areflexia. Repetitive nerve stimulation (RNS) evoked a low amplitude muscle action potential (0.5-2.0 mV) with marked facilitation following exercise or with rapid nerve stimulation. All patients had biopsy proven SCCL. Treatment consisted of surgical resection (1 patient), radiotherapy alone (1), and radiotherapy plus chemotherapy with cyclophosphamide, Adriamycin and vincristine (4). 3 patients received guanidine initially.

3 of 5 had marked improvement of strength and RNS with effective resolution of their malignancy. 2 had persistent, but less weakness on guanidine despite initial resolution of their SCCL. 2 of 3 with recurrent fatal metastatic disease showed no recurrence of MYS subsequently.

The improvement seen in the MYS in some of these patients may be due to either the immunosuppressive therapy, or the response of their malignancy. It is unclear why some patients fail to improve with successful initial resolution of their SCCL, or why others do not develop recurrent weakness with metastatic disease.

60.

Quantal and Non-Quantal Release of Acetylcholine in the Lambert-Eaton Syndrome Passively Transferred to Mice

J. NEWSOM-DAVIS, P. MOLENAAR, B. LANG, A. VINCENT, C. PRIOR and D. WRAY (London, England)

The Lambert-Eaton myasthenic syndrome (LEMS) is characterized by a decrease in the quantal and non-quantal release of acetylcholine (ACh) at the neuromuscular junction. The principal physiological features of the disorder can be transferred by LEMS IgG to mice, implicating an IgG autoantibody in disease pathogenesis (Lang et al 1981). Quantal and non-quantal release of transmitter have here been further investigated in the passive transfer model.

Mice were injected daily with IgG (10mg intraperitoneally for 39-55 days) prepared from LEMS plasma or from normal pooled human plasma (control). Endplate potentials (epps) were recorded with microelectrodes from diaphragm muscle in Krebs solution containing tubocurarine. The quantal content (m) of the epps was measured using the variance method. ACh was measured in the incubation media by pyrolysis-mass fragmentography.

In mice injected with IgG from 4 patients (two with known oat-cell carcinoma), m was reduced in all four and significantly ($p<0.001$) in three. The exception was clinically the least severe case.

Measured ACh release at 3 Hz stimulation of the phrenic nerve was significantly ($p<0.02$) reduced compared to controls. Resting release was also significantly reduced ($p<0.008$).

These findings indicate that IgG antibody from LEMS patients may bind nerve terminal determinants in mice that are concerned in quantal and non-quantal transmitter release.

61.

Amyloid Neuropathy - A Cluster of Five Cases

P. DERVAN, P. KELLY and H. STAUNTON (Dublin, Eire)

Five cases of amyloid neuropathy are described. They presented over a period of two years and all originated from a single, sparsely populated, county. Three were male and two female. Their ages ranged from 56 to 73. Two presented with autonomic, two with distal sensory neuropathy initially in the legs and one with dissociated sensory neuropathy of the hands. All had minor motor involvement. The diagnosis in four was made by the demonstration of amyloid in a sural nerve biopsy using the Sirius Red stain and crossed polarized light, in the fifth amyloid was found in a rectal biopsy. No patient had evidence of a monoclonal gammopathy or plasma cell dyscrasia apart from one who had a slight marrow plasmacytosis.

62.

Acute Polyneuropathy: A Newly Recognised Complication of Major Systemic Illness

C.F. BOLTON, J.J. GILBERT, A.F. HAHN, J.D. BROWN and W.J. SIBBALD (London, Ontario)

Twelve patients developed an acute motor and sensory polyneuropathy at the peak of critical illness. Five were identified between 1977 and 1981, and the remainder, since then, as a result of more systematic investigation.

The primary illnesses were diverse, but all developed multi-organ dysfunction, particularly sepsis and pulmonary insufficiency. As the systemic illness improved, we observed difficulty in weaning from the ventilator, mild facial weakness and variable motor and sensory signs in the limbs. The polyneuropathy was severe in six, moderate in three and mild in three. The cerebrospinal fluid was unremarkable. Comprehensive electrophysiological and morphological studies, including autopsy examination of the central and peripheral nervous system in three patients,

indicated a primary axonal degeneration of peripheral nerve motor and sensory axons.

Extensive investigations to determine the cause have proved negative. However, eight patients improved following institution of total parenteral nutrition. Seven later died of unrelated causes. This distinctive polyneuropathy should be recognized and managed vigorously because of the potential for recovery.

63.

Carpal Tunnel Syndrome: Failures of Surgical Treatment

C.A. ZAHN and H. BERRY (Toronto, Ontario)

Median nerve compression at the wrist is a common cause of hand numbness and is one of the commonest of peripheral nerve disorders. Surgical section of the flexor retinaculum is generally accepted as the definitive treatment and is usually successful. There is little published information about those patients who fail to respond to this treatment.

We reviewed 85 patients (86 carpal tunnel syndromes) with a persistence or exacerbation of symptoms after surgical treatment. The pre and post-operative clinical and electrophysiologic findings, and where applicable, the findings at a surgical re-exploration, were reviewed.

The commonest cause of surgical treatment failure was that of an incorrect initial diagnosis. This included the conditions of functional (non-organic) sensory motor disturbance with normal electrical values, arthritic involvement of the hands, generalized sensory motor neuropathy, and early scleroderma. The next commonest cause was that of surgical technique, namely, incomplete section of the retinaculum. Examples of scarring about the median nerve, neuroma formation and lipoma were also encountered.

Treatment failures can be largely avoided by appropriate sensory motor nerve conduction studies prior to operation, and by adequate surgical exposure and complete section of the flexor retinaculum.

64.

Risk Estimates for Congenital Myotonic Dystrophy

A. GLANZ and F. CLARKE FRASER (Montreal, P.Q.)

Children who receive the autosomal dominant gene for myotonic dystrophy from their mothers may develop the more severe congenital type, rather than the late onset type. To estimate the risk of the congenital onset form in the offspring of affected mothers, we ascertained 81 affected families from various centers in North America. In 22 families, the proband had congenital onset, and in 59, late onset. The segregation ratio did not differ significantly from the expected 50%.

As there were no instances of a congenital onset case born to an affected father, the following risk figures were derived only from maternal transmission of the disease: The risk of the congenital onset form in siblings of congenital probands was 29%, whereas for the offspring of the proband's affected female relatives, the risk was 5% ($P<0.01$). In families ascertained through late onset females, the risk of a congenital form was also significantly lower than in siblings of congenital probands (5%).

In families with myotonic dystrophy, it would be important to do clinical and EMG examinations of asymptomatic relatives at risk, as well as genetic linkage studies and prenatal diagnosis, where feasible.

65.

The Emery Dreifus Muscular Dystrophy (EDMD)

J.P. BERNIER, S. GOSSELIN, J.B. LAMARCHE, M.L. LEBEL (Sherbrooke, P.Q.)

Despite its confirmation as a distinct entity in 1978, EDMD has rarely been reported since then. We first describe a single sporadic male patient seen at 29 years old. He exhibited all the distinctive features of EDMD: humero-peroneal weakness and atrophy, neck and elbow contractures and cardiomyopathy. He came to us with a left hemisphere embolic stroke that recovered well. First hand documentation of such a complication was never possible to our knowledge, for previous observers. His serum CPK were slightly elevated, EMG was "myopathic", muscle biopsy showed chronic dystrophic features in addition to type I fiber predominance. The patient required a permanent pacemaker and long-term anticoagulation. Two further cases are reported, brothers seen in their late twenties, sharing most of the features of EDMD, but so far lacking the cardiac manifestations. The muscle biopsy taken from the younger brother showed numerous atrophic ring fibers, not an usual finding in EDMD. The X-linkage could not be established with certainty in these three cases. Because of the definite risk of sudden death and stroke in EDMD, the accurate classification of the non-dominant humero-peroneal muscular diseases in male subjects undoubtedly deserve special attention.

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Poster Presentations

66.

Delayed Posttraumatic Stroke

R. GRIEBEL, J.D. McQUEEN and M.I. KHAN (Saskatoon, Sask.)

Intracranial hematomas, contusions and carotid artery or venous sinus damage are obvious causes of posttraumatic stroke syndromes. We describe two cases of unusual posttraumatic stroke with signs and symptoms mimicking those of a major thrombosis of, or embolization to, a middle cerebral artery. In one case, left hemiparesis appeared suddenly eleven days after a fall on stairs and a loss of consciousness of several minutes duration. The other patient also fell and was unconscious for fifteen minutes. She developed a sudden fluent dysphasia nine days later Lateralizing headache was a prominent feature in both cases. Vascular obstruction and/or reduced flow was shown in one case with angiograms and the demonstration of recannulization of a thrombosis, and in both cases with dynamic isotope studies. There was no evidence on CT scans of delayed hematoma formation in either instance. Both patients made an excellent recovery and the headache resolved with the deficit. The pertinent mechanism will be discussed in terms of the delayed release of vasoactive materials or vascular trauma. The relationship to posttraumatic migraine will be considered.

67.

Aspirin Treatment Before Carotid Endarterectomy - A Cause of Wound Hematomas

L. LEWIS, J.F.R. FLEMING and H. SCHUTZ (Toronto, Ontario)

Many patients are treated with platelet antiaggregants while awaiting admission for carotid endarterectomy. Until recently, it was our custom to pre-treat patients with aspirin before endarterectomy, in an attempt to decrease the thrombogenicity of the endarterectomized vessel. Because of increasing numbers of neck hematomas in these patients, and the suspicion that aspirin might be related, the use of aspirin within several days before surgery was subsequently discontinued.

A retrospective review of 100 consecutive carotid endarterectomies was underten a few months later. It so happened that 54 patients had been given aspirin within five days of surgery, and 46 had had no aspirin or other platelet antiaggregant within five days of surgery. In the aspirin treated group, there were seven neck hematomas, three of which required surgical evacuation, and one of which necessitated tracheal intubation. In the untreated group, there was only one mild hematoma, not requiring treatment.

The incidence of post-operative cerebral infarction was the same in the two groups. One patient in each group suffered a stroke in the first few post-operative hours. Post-operative transient ischemic attacks in the territory of the operated carotid artery occurred in an unusually high number of patients in this particular series. However, the TIA's occurred with equal frequency in each group (four in the treated and five in the untreated group). There was one post-operative death from a basilar infarction in the non-treated group, and no deaths in the aspirin treated group.

Thus pre-treatment with aspirin conferred no protection against stroke or TIA in the post-operative period, and was associated with a high incidence of post-operative wound hematomas ($p = 0.05$).

68.

Ischemic Cerebral Disease in Young Adults

G.M. KLEIN and P. SELAND (Calgary, Alberta)

This retrospective study documents the experience of two large Canadian teaching hospitals with ischemic cerebral disease in young adults. Chart review disclosed 76 patients aged 15-40 years during a recent 6 year period. An apparent cause or significant coincident risk factors were identified in 51 patients (67%). The most frequently recognized causes were atherosclerosis, emboli from cardiac sources or intracranial aneurysms, and complex migraine. Pregnancy or use of oral contraceptives were apparent coincident risk factors.

In the light of this study, the following conclusions were made. In young adults, ischemic cerebral disease is common. Identifiable, and often treatable causes, are frequently present. An embolic source for cerebral ischemic disease is more common than atherosclerosis. In Calgary, use of oral contraceptives seem surprisingly infrequent in the female population of stroke victims.

69.

The Timing of Antiocoagulation in Embolic Cerebral Infarction

A.M. HAKIM, A.J. FURLAN, R.G. HART and D.G. SHERMAN (Montreal, P.Q.)

A total of 46 patients with cerebral infarction (CI) who satisfied clinical criteria for a probable cardiogenic source for emboli were prospectively randomized in a multicenter study into an "early" or "late" anticoagulation group. None had shown any evidence of hemorrhage on initial CT, and all sizes of infarction were included. Twenty-five patients received full heparin anticoagulation within 48 hours of onset of CI and twenty-one received it 10 days later. Serial neurologic and CT examinations were used to monitor the recurrence of embolic events and the appearance of hemorrhagic infarction.

Sixty-seven percent of the patients in the early group and 70% in the late group suffered from atrial fibrillation. Other presumed etiologies for the CI included a recent myocardial infarct and cardiac valve prostheses. There were no complications with immediate heparinization in unselected patients with all sizes of embolic CI, and we advise in the absence of clinical and radiological contraindications that anticoagulation may be instituted early. None of the patients in the "early" group suffered a recurrent embolic event once heparinized, but ten percent of the patients in the "late" group suffered recurrent systemic or CNS embolic events while awaiting to be anticoagulated. Finally, anticoagulation neither induced the appearance of hemorrhagic infarction on CT nor interfered with its resolution.

70.

Aphrodisia on Treatment for Parkinsonism

A.H. RAJPUT, S. TCHANG (Saskatoon, Sask.)

Soon after levodopa became available for general use the aphrodisiac effect of the treatment made headlines but very little has been reported on that aspect in recent years. We are presenting our observations in 5 cases. Three of these were males and 2 females. Mean age of onset of Parkinsonism was 42 (25-54) years. Two males were married and were known to be sexually very active prior to the onset of their illness. The other 3 were all unmarried and had very little if any sexual contact. After second thalamotomy each of the 2 married men experienced marked increase in sexual appetite and all 3 males had excessive sexual urge on levodopa therapy. This lead to significant social problems in 2 cases. Aphrodisiac effect was experienced by 1 female on levodopa and the other one on Bromocriptine.

It is concluded that aphrodisiac effect may be seen on levodopa or dopamine agonists. The same may occur after bilateral thalamotomy in susceptible individuals. Those whose sexual needs are unusually strong or those who have not had adequate sexual outlet are prone to this side effect. Bilateral thalamotomy may release normal inhibitions to sexual drive which is further potentiated by drug therapy. Clinical details and site of lesions based on CT scan will be presented.

71.

Radial Compression Neuropathy in Advanced Parkinson's Disease. A Contributing Factor in the Development of Late Stage Fixed Hand Deformity

J.D. GRIMES, D. PRESTON, R. MIRELES, M. DELGADO and P. GRAY (Ottawa, Ontario)

Postural deformities of the hand have been described in late stage Parkinson's disease. A basal ganglia origin has been previously postulated. Over a 2 year period, 4 patients (out of a clinic population of 250) developed a radial nerve palsy. The patients were older (mean 72 years), average disease duration was 10 years, and all had advanced disability (stage 5). At the time of onset all were bed or wheelchair dependent.

All 4 patients had complete wrist drop with clinical features typical of radial compression neuropathy. Nerve conduction studies were performed on 2 patients. One showed complete, and the other incomplete block of radial motor conduction in the upper arm segment. Sensory conduction was preserved in both patients. Three patients showed complete clearing of radial distribution weakness over 5 months. One markedly disabled extremely bradykinetic, rigid, bed confined patient, developed a fixed ninety degree flexion deformity of the wrist which was not improved 10 months later. Repeat radial nerve conduction was however improved at this time.

Radial compression neuropathies appear to be relatively common in advanced Parkinson's disease. The prognosis is usually good but in some patients the radial neuropathy may be an initiating factor in the development of a fixed, irreversible flexion deformity of the wrist. Early use of a wrist splint could likely avoid a permanent fixed deformity. Peripheral, in addition to central factors, should be considered in the development of late limb deformities in patients with advanced Parkinson's disease.

72.

Parkinsonism as a Manifestation of Brain Tumour

K. POLYZOIDIS, R. GRIEBEL, A.H. RAJPUT, D.J. MacFADYEN and J.D. McQUEEN (Saskatoon, Sask.)

Intracranial neoplasm is a rare cause of Parkinsonism. We present three cases of intracranial tumor whose major manifestation was Parkinsonism. The first patient presented with depression, followed by hand tremor which was initially attributed to medication. A family history of Parkinsonism complicated the picture. A sphenoid wing meningioma was resected resulting in disappearance of the tumor. The second patient had mental changes, hand and head tremor and rhinorrhea. Removal of a large convexity meningioma controlled her tremor. The third patient had a large glioblastoma extending to the midbrain. Radiation treatment offered no benefit. Various mass lesions directly or indirectly involving the substantia nigra or globus pallidus may produce Parkinsonism. Frontal lobe neoplasms are most common. Other categories include subependymomas, infundibular and posterior fossa neoplasms. The majority of reported patients harbored a primary extrinsic tumor. Unilaterality of signs is suggestive of a neoplasm. Pertinent mechanisms will be discussed.

73.

Abstract Withdrawn

74.

An Atypical Case of Progressive Supranuclear Palsy (PSP)

A.J. GOMORI and A.A.F. SIMA (Winnipeg, Manitoba)

A 59 year old woman presented to hospital with double vision. On examination she had mild dementia, left sixth and third nerve palsy with pupillary sparing, complete left peripheral facial weakness, mild proximal limb weakness and gait ataxia. Extensive investigations were negative and she was treated with intravenous ACTH. Within two weeks she showed improvement, developed transient facial palsy which recovered within a few days. Examination three months after admission showed only minimal left facial weakness. She was well until two years later when she presented with a generalized seizure. Subsequent course was characterized by progressive dementia, aphasia as well as ophthalmoplegia, dysarthria and dysphagia. She died 24 months after the onset of her illness.

Neuropathologic examination revealed the presence of neurofibrillary tangles in various brainstem, cerebellar and subthalamic nuclei. Ultrastructural examination demonstrated 150 Angstrom straight tubules, confirming the diagnosis of supranuclear palsy. No neurofibrillary tangles were found in the hippocamhus or neocortex.

We believe that the atypical clinical presentation and the prolonged remission in this patient (which happened to coincide with ACTH therapy) represents a greater variability in the natural history of PSP than previously recognized.

75.

Atypical Presentation of Progressive Supranuclear Palsy

P. DAVIS, C. BERGERON and D. McLACHLAN (Toronto, Ontario)

Five autopsy cases of progressive supranuclear palsy with typical light and electron microscopic findings are reported. Three of the patients presented with severe dementia and two patients presented with Parkinsonian features. The patients either did not have opthalmoplegia or developed it late in their course. On retrospective analysis, clues to the diagnosis included early, prominent gait disturbance, tendency to keep their eyes closed and dystonic rigidity of the neck which was held in extension. Psychometric testing of the demented patients revealed no specific pattern and CT scans revealed diffuse cerebral atrophy. Pathological examination revealed no cell loss and infrequent tangles in the nucleus basalis of Meynert. Clinicopathological correlation was poor because of the end-stage nature of the disease at the time of pathological examination.

76.

The Loss and Reappearance of Auditory Brainstem Responses in Severe Hypoxic-Ischaemic Injury

B.D. HOUSTON, M.J. TAYLOR and N.J. LOWRY (Toronto, Ontario)

Many reports have noted the absence of auditory brainstem responses (ABRs) just prior to death in severely brain injured patients. In no reported case has there been recovery of all five waves after their loss with this type of insult; one study showed return of waves I and II in two patients (Tsubokawa et al., 1980).

We report a case of a 33 month old boy admitted following a severe hypoxic insult associated with near drowning. On day 2 he was comatose but withdrew from painful stimuli, had unequal pupillary light responses and unilateral dysconjugate oculovestibular responses. ABRs on day 2 showed increased interpeak latencies of waves I-V bilaterally, but all the waves disappeared by day 5 and were still absent 4 days later. Associated with this was loss of the response to painful stimuli. By day 14 waves I-III reappeared bilaterally at prolonged latencies accompanied by return

of corneal reflexes, oculocephalic and oculovestibular responses. By week 20, wave IV had also returned bilaterally. All five of the ABR waves were present bilaterally by 29 weeks, but there was increased I-III interpeak latency with right ear stimulation and bilateral reduction in the amplitude of wave V. This patient never fulfilled the clinical or EEG criteria of brain death but remains in a state of severely impaired awareness with spastic quadriparesis.

This report demonstrates that all five waves of the ABR can reappear following their loss in severe cerebral injury, and demonstrates the possibility of prolonged survival following a flat ABR. The loss of ABRs following severe cerebral insults is being used increasingly as a parameter of brain death. This study shows that reversible factors can lead to the loss of the ABR, and reaffirms that a flat ABR following this type of injury cannot be used by itself as a criterion of brain death.

77.

Pharmacokinetics of Enteric-Coated Valproic Acid (Depakene®)

P.S. ALBRIGHT and J. BRUNI (Toronto, Ontario)

Valproic acid (VPA) is a major antiepileptic drug used in the treatment of absence, myoclonic, and generalized tonic-clonic seizures. Recently, an enteric-coated formulation of this drug has been introduced in Canada. The purpose of the present study was to examine the kinetic parameters of the enteric-coated and regular VPA in epileptic patients. Five epileptic patients received 1000 mg of VPA as either the regular capsule or the enteric-coated capsule in a crossover design. The drug was taken after an overnight fast and blood samples were drawn at 1, 1.5, 2, 3, 4, 6, 8, 10, 12, and 14 hours after VPA administration. Pharmacokinetic parameters were equivalent for both preparations except for an absorption lag with the enteric-coated form. Bioavailability of the two compounds was similar across the group of patients although there were marked differences between individual subjects. Close supervision of VPA serum levels is suggested after a change in drug formulation.

78.

Recognition of Artifacts in Ambulatory Cassette Electroencephalograms

P.B. JAYAKAR, J. PATRICK, G. ARBEZ, E. SHWEDYK and S.S. SESHIA (Winnipeg, Manitoba)

Ambulatory electroencephalograms (AEEGS) are predisposed to physiological and instrumental artifacts, which can make interpretation difficult.

We have characterised some of the artifacts in the AEEGs of 4 subjects, induced artifacts from various parts of the recording system, and have measured their power density spectra using the autoregressive model.

Physiological artifacts produced by blinks, eye movements, chewing and smiling, had recognisable characteristics. Acts like coughing and startling caused sharp and/or slow waves unaccompanied by muscle artifact. High voltage focal artifacts were seen during walking and were similar to those caused by movement of the preamplifier cable input plug at the recorder socket. A poor connection between the electrode cable and preamplifier generated high voltage activity. Defective amplifier boards in the recorder produced focal slow or sharp waves.

We found a model order of 10 suitable for the evaluation of the power density spectra of the artifacts. As expected, the spectra of artifacts produced by chewing and smiling had peaks at higher frequencies, whereas those of eye blinks or movement were at lower. The peaks and shapes of the spectra differed from one type of artifact to the other.

The recognition of artifacts and identifying their respective sources, are essential steps in the interpretation of AEEGs, and, in eliminating those of instrumental origin. Should the power density spectra be confirmed to be specific, they could be incorporated into pattern recognition systems for the automatic analysis of AEEGs.

Funded by: Health & Welfare, Canada and the Children's Hospital of Winnipeg Research Foundation, Inc.

79.

Computer Database for Prolonged Ambulatory Electroencephalograms (AEEGs)

E. SHWEDYK, E. BRUSSE and S. SESHIA (Winnipeg, Manitoba)

The vast amount of data obtained during AEEGs necessitate some form of automatic data analysis. A major consideration in the development of a pattern classification algorithm for such analysis is its evaluation. Because of intersubject variability in EEG rhythms, meaningful evaluation can only be done by studying algorithm performance with an extensive data base.

We describe the design of an annotated computer database for AEEGs. Data from subjects are entered in 5 minute segments. Each segment has a profile listing which typically includes the name, sex, age, recording date, medication, montage and an annotation summary.

Annotation of each segment consists of classifying the data in one of fourteen classes:

GROUP I: Alpha 1 (8-10Hz); Alpha 2 (10-13Hz); Delta low ($<75\,\mu$ V, 4Hz); Delta high ($>75\,\mu$ V, <4Hz); Theta low ($<75\,\mu$ V, 4-8Hz); Theta high ($>75\,\mu$ V, 4-8Hz); Low amplitude ($<20\,\mu$ V); Beta (>15Hz).

GROUP II: Isolated spike; Isolated sharp wave; Polyspike; Spike and slow wave; Sharp and slow wave.

GROUP III: High frequency artifact; Low frequency artifact.

GROUP IV: Unclassified (questionable or indeterminate).

The program allows for a maximum of 99 classes.

Each EEG segment has 7 annotation files to permit up to 7 independent classifications. Their "consensus" is entered in an eighth file.

The database is stored on a standard 9 track digital magnetic tape, length 2400 ft., density 6250 bytes per inch for portability.

Such a database could form the basis for a generally accepted standard. It could be used to compare different pattern recognition systems. This would benefit both users and developers of such systems.

**Funded by Health & Welfare Canada and Children's Hospital of Winnipeg Research Foundation.

80.

Difficult Behaviour in Epileptic Children

E.H. ROLAND and G.G. HINTON (London, Ontario)

100 epileptic children were reviewed to identify those children at greatest risk for behavioral complications and so allow prompt, comprehensive management.

32 children with seizures had associated moderate-severe behaviour problems - almost twice the incidence found in 100 closely matched children with chronic headache.

One-third of children in each of the categories of generalized (36 cases), absence (20 cases) and partial complex (18 cases) showed behavioral abnormalities. Those with focal motor (11 cases) and benign centrotemporal epilepsy (15 cases) had significantly less difficulties.

Young epileptic children with behavior problems were almost exclusively hyperactive (17 cases). Aggression emerged in boys and girls around adolescence (10 cases) and several girls were depressed (5 cases).

75% of problematic children with seizures had associated learning difficulties. 30% came from disrupted homes. Behavioural effects of anticonvulsants were also important. 20% of all medication changes were necessitated by difficult behavior.

We conclude that epileptic children showed the same quality of behavior as children referred with another chronic problem of headache, but complicated by seizures, medication, learning difficulties and family problems. Behavior has important implications for management of epileptic children.

81.

Musicogenic Epilepsy

S. BRIEN and T.J. MURRAY (Halifax, Nova Scotia)

We report a case of musicogenic epilepsy in which the seizures are precipitated by singing voices, often those on television commercials, and

by particular popular singers. It was found that some singers voices were particularly epileptogenic and some songs by a specific singer might precipitate a seizure, but not others. Study of the songs and singers that precipitated seizures did not reveal any common key, cord, harmonic interval, pitch or rhythm. Emotional feeling or intensity of the music did not seem to be relevant. A study of the singers voice production demonstrated that on the songs that precipitated seizures, their voices exhibited a throaty, "metallic" quality. Such a singing voice results from an incorrect positioning of the larnyx so that it is not allowed to descend fully during singing and produces a vowel sound with a metallic quality that is amplified by recording techniques. The column of sound production is localized to the area just above the jugular notch to the mouth, producing a "twang" that has become a characteristic of many country and western and pop singers. This sound is more common in singers with lower ranges and particularly "microphone performers" who compensate for this incorrect quality by singing softly. This quality is not seen in operatic or stage sopranos due to the mandatory projection and range required to perform successfully. We have demonstrated that a trained singer could produce a seizure in our patient by singing in this fashion, but not if the same song was sung with correct technique. This is the first instance in which the cause of musicogenic epilepsy has been related to the specific quality and techniques of the singers voice.

82.

Functional but not Morphological Recovery in a Chronic Solvent Abuser

L. FORNAZZARI, P.L. CARLEN and D.A. WILKINSON (Toronto, Ontario)

A 24 year old male, with a ten year history of daily abuse of approximately 400 g of Toluene, was examined on admission to hospital. He demonstrated a severe pancerebellar syndrome (characterized by truncal and limb ataxia, and intentional tremor), a severe memory and moderate cognitive impairment, marked cerebral and cerebellar atrophy on CT scan, and a primary CSF acidosis due to increased Cl^-. Re-examination after two years abstinence from the toxin showed a slight intention tremor, and no other neurological deficits. The WAIS performance IQ increased from 63 to 98, Memory Quotient from 68 to 88 and the standardized heel-to-toe talking tests (Heath Rail) progressed from grossly impaired to normal levels. However no changes were observed on a repeated CT scan. A videotape of the movement disorder will be shown.

83.

Partial Status Epilepticus Can Cause Prolonged Focal Cerebral Oedema

M.R. SAMMARITANO, F. ANDERMANN, D. MELANCON, H. PAPPIUS, A. SHERWIN (Montreal, Quebec) and P. CAMFIELD

Following five days of partial status epilepticus, two patients developed severe focal cerebral oedema demonstrated on C.T. scan. A capillary blush was found on the angiogram in one in the corresponding area. Such vascular changes have been previously described by Lee and Goldberg (1977) during focal status. The severe neurological deficits and cerebral oedema of both patients resolved completely, as evident on serial C.T. scans.

In the first patient, the presence of a preexisting mass lesion in the temporal lobe, and in the second, a vascular occlusion in the centro-parietal region were suspected; in both, there was no evidence for a lesion when the oedema resolved.

Although documentation has been sparse, cerebral oedema has been suspected to be associated with or caused by status epilepticus. These patients show that severe focal oedema does not necessarily indicate the presence of a preexisting underlying structural lesion or of an acute vascular occlusion.

The associated neurological signs, although long lasting (six months and 1 month respectively) are reversible. The area of maximal oedema coincides with clinical, radiological and electrographic localization of the focal seizures. The changes suggest vasogenic oedema perhaps related to long lasting disruption of the blood brain barrier.

The neurological and C.T. findings should lead to recognition of this syndrome in patients who had prolonged focal status. Similar mechanisms though of lesser intensity may be responsible for some of the shorter lasting postictal focal neurological deficits seen following status.

84.

Pharmacokinetics of Carbamazepine in Children

K. KEELY, D.L. KEENE, H. HEICK and P. HUMPHREYS (Ottawa, Ontario)

Carbamazepine has been in use for the treatment of childhood seizure disorders since the early 1970's. Although the pharmacokinetic properties of this drug have been well documented in the adult population, there is only limited data available for the pediatric population. Extrapolation of the adult data to the pediatric population has led to problems with side effects. It was the object of this study to obtain a better understanding of the pharmacokinetic properties of carbamazepine in childhood. Nineteen newly diagnosed epileptic patients, ages 2 - 16 years who had never received anticonvulsant medications, were entered into the study. An oral loading dose of 10 mg./kg. of Tegretol was given. Serial blood samples were obtained over the next 48 - 72 hours. Maintenance Tegretol was started and the study was repeated in 3 months. The pharmacokinetic data is summarized below:

	2 - 4 years		5 - 9 years		10 - 15 years	
	T max	T 1/2	T max	T 1/2	T max	T 1/2
Load One	3	18.1	2.67	15.3	4.67	26.3
Load Two	5	3.13	4.33	4.83	6.37	8

This data confirms that the pharmacokinetics of Tegretol is age dependent and the metabolism is autoinduced. In the development of a rational treatment regime for Tegretol in the pediatric population, these facts must be considered.

85.

Anterior Callosotomy in the Surgical Management of Some Uncontrollable Epilepsy

G. BOUVIER, C. MERCIER and J.M. ST-HILAIRE (Montreal, Quebec)

Chronic depth electrode recording used routinely in our institution has permitted the discovery of more and more focal epilepsies: Cortisectomy remains an outstanding treatment with an average success rate of 85%.

This technique of recording has enabled us to indentify multi-focal epilepsy or foci that diffuses too rapidly to be reasonably sure of cure with limited cortical ressection or foci situated in or near important brain functional area where cortical ressection would represent a high risk of complications.

5 patients with multi-focal epilepsy, 3 of them being bi-frontal, had an anterior callosotomy with excellent results. 3 other patients were submitted to a limited anterior callosotomy, an adjunction to a cortical ressection. Finally, one patient with a left motor suplementary area focus had an anterior callosotomy.

Anterior callosotomy has to be considered as an excellent palliative treatment for intractable epilepsy. There was no mortality and the low morbidity associated with the tremendous reduction in the number of seizures encourage us to offer this form of treatment. As to the mechanism of control of the seizures, it seems to be one of blocking of the generalization of the epileptic discharge through the anterior corpus callosum.

86.

Evaluation of Anticonvulsant Effects on Cognitive Performance in Children with Benign Epilepsy of Childhood - Rolandic Spikes (BECRS)

M.J. GERBER, K. METRAKOS, J.E. SPINDLER, C. O'ROURKE and G. WATTERS (Montreal, Quebec)

Children with Benign Epilepsy of Childhood - Rolandic Spikes (BECRS) received EEGs and tests of cognitive and learning ability prior to initiation of anticonvulsant treatment. Testing was repeated six months after treatment had begun.

There were sixteen BECRS patients (12 males and 4 females, aged 8.7 years to 12.6 years) and nine unaffected sibling controls. Complete seizure control was obtained for all BECRS patients within one month. All patients were on mono therapy (12 on Tegratol; 4 on Dilantin). Anticonvulsant drug levels were all in good therapy range.

The cognitive functioning battery included: The Wechsler Intelligence Scale for Children - Revised (WISC-R); the Durrell Analysis of Reading Difficulty (a measure of academic functioning); the Bender Gestalt Test of Visual-Motor Functioning; and a paired associate word list (a test of learning and memory.)

BECRS patients were of average intelligence, but scored significantly lower than their siblings on Performance IQ subscales. They were also significantly lower on tests of new learning, short term memory and visual motor functioning. The patients' performance did not change following six months of anticonvulsant therapy while the performance of their siblings improved at retesting. There is no evidence that anticonvulsant treatment impairs the cognitive functioning of BECRS patients.

87.

Topographical Evolution of Spike-Wave Complexes

W.T. BLUME and J.F. LEMIEUX (London, Ontario)

Two 16 electrode grids (4 x 4), centred frontally, referentially recorded apparently bilaterally synchronous spike-wave complexes of patients with absence attacks. Each grid gave complementary information: one faced longitudinally and transversely, the other diagonally.

The amplified output of 16 electroencephalograph channels are digitised by a PDP 11/60 computer at 200 Hz/channel for epochs up to 60 sec. Recordings are stored and displayed on a VT 11 scope. At each instant the computer algorithm extrapolates 400 data points from the digitised output and constructs the field in 3 dimensions.

Representing changes of the field with time by sequential pictures of samples provides the illusion of continuous flow. The display can be stepped through frame by frame or allowed to run continuously over the recording period at a speed 15 times slower than real time. Selected frames can be plotted for detailed analysis and documentation. The recordings can be played back at any rotation or tilt of the grid to obtain the best viewpoint.

Field distribution of spike differed from that of waves. Spikes arose in one frontal region and propagated to the homologous part of the other frontal region with a peak to peak interval less than 15 msec. Less commonly, spikes first moved anteriorly within the initiating frontal region before contralateral propagation occurred.

Succeeding positive troughs evolved more symmetrically than did spikes but less than ensuing negative waves.

Negative waves were more diffuse, more symmetrical in evolution, and more posteriorly centred than either spikes or troughs.

This type of display reveals properties of spike-wave complexes which may not be appreciated by standard paper write-out.

88.

Thalamic Components of the Somatosensory Evoked Potential (SEP)

M.J. TAYLOR and S.E. BLACK (Toronto, Ontario)

It is generally accepted that the neural generators of the far-field subcortical waves are the afferent volleys passing through the brachial plexus (P9), the cervical dorsal columns (P11), the cuneate nucleus (P13) and the medial lemniscus (P14). Waveforms between P14 and the primary cortical response (P20) have not been found consistently, although Abbruzzese et al. (1978) and Eisen (1982) have suggested that components at 16 and 17 msec arise from the thalamus and thalmocortical projections. To investigate this issue we studied the far-field SEPs in 20 normal adults using a 40k gain, 25 msec sweep and a 150-3000 Hz bandpass. Most researchers in this field have used a 3- or 30- 3000 Hz bandpass. We recorded simultaneously over C3 and C4 using a noncephalic reference on the contralateral clavicle. The following series of positive waves (upward deflection at G1) were found reliably in all subjects: P9, P11, P13, P14, P16, P17, and P20.

We found significant ipsilateral and contralateral amplitude asymmetries beginning with the negative deflection after P14 and including P16 and P17. The amplitude was greater over the contralateral hemisphere; P16 and P17 were not always found ipsilaterally. Our data suggest that both P13 and P14 are generated in the cuneate nucleus before decussation of the afferent fibres in the medial lemniscus. Simultaneous bilateral recording allowed detection of this asymmetry which has not been previously reported as a means of determining the electrophysiological correlates of decussation.

We believe that P16 and P17 arise from the thalamus and/or thalmocortical projections. Since the thalamus is an essential relay in the somatosensory pathway one should find corresponding waveforms in the far-field recordings. We feel that this is dependent upon the bandpass used and contend that with the above paradigm these thalamic components can be reliably recorded. We also conclude that P13 and P14 arise from the cuneate nucleus prior to decussation.

89.

EEG/EP Monitor with Neurosurgical Applications

S. ZIGANOW, W. GENTLES and D.W. ROWED (Toronto, Ontario)

Electroencephalograms (EEG's) and evoked potentials (EP's) are widely used as noninvasive tests of neurological systems. At Sunnybrook we have developed a special purpose monitor for the evaluation of EEG's and somatosensory EP's. This project began because we found the commercially available equipment limited by its lack of on-line data analysis. The monitor's programs are designed to be self-teaching and do not demand a high level of skill on the part of the operator as the operator is guided through each step of the procedure by a series of menus and diagrams.

The monitor is intended for the assessment of spinal cord integrity and cerebral blood flow during surgery. It incorporates a microcomputer and a colour graphics display to permit instantaneous interpretation of results. The displays are informative, presenting not only the waveforms, but also numerical evaluations of the waveforms. The SEP acquisition programs provide for continuous and discrete monitoring of either average or single sweep data. There are a variety of pattern recognition programs which assist in the evaluation of the SEP and its changes in the spinal cord injured patient. The frequency analysis program to be used for cerebral blood flow studies assesses the power spectrum of ongoing EEG activity as well as the ratio of slow to fast wave activity.

The presentation includes photographs of the monitor, the hardware block diagram, the software flow chart, examples of didactic displays, and samples of data from neurosurgical patients. The implications for intraoperative monitoring of spinal cord integrity and cerebral blood flow are discussed.

90.

Triphasic Waves Revisited

M.B.M. SUNDARAM and W. BLUME (London, Ontario)

We defined triphasic waves as bilaterally synchronous bursts whose waveforms have 3 phases: initial negative wave (I); then positive (II); and final negative wave (III). 66 of 16641 EEGs (representing 57 of 10476 patients) contained triphasic waves. 26 EEGs (26 patients) were from patients with metabolic encephalopathy - hypoxic, ischemic, hepatic, renal or combination (Group A); 40 EEGs (31 patients) were from other disorders (dementia - 27 patients; miscellaneous - 4 patients) (Group B).

In both Groups (A and B), the relative prominence of waves I, II and III varied within and between recordings. Triphasic waves with prominent waves II characterised 43 EEGs; equally prominent waves I & II were the most usual in 19 recordings while predominant waves II and III typified only 3 EEGs. All types of triphasic waves appeared in equal abundance in one recording.

In the metabolic group, the quantity or mode of occurence (single waves or short bursts or long runs) did not vary with level of consciousness, degree of background slowing or etiology. Posteroanterior delay occurred in 10 EEGs; anteroposterior delay in 1 EEG; both in 4 recordings.

In the dementia group, triphasic waves occurred singly (27 EEGs) or in short bursts (12 EEGs) and almost never in long runs (1 EEG).

Waveforms closely resembling sharp and slow wave complexes ap-

peared among triphasic waves, in 14 out of 26 EEGs in Group A and in 7 out of 40 EEGs in Group B. We have also observed triphasic waves in EEGs with sharp and slow wave complexes. The incidence and nature of this association will be presented.

91.

Progressive Myoclonus Epilepsy: Blockade of Epileptic Photosensitivity by Dopaminergic Agonsists

M. KRELINA, F. ANDERMANN and L.F. QUESNEY (Montreal, Quebec)

Previous studies have shown that apomorphine blocks epileptic photosensitivity in patients with photosensitive primary generalized epilepsy. Recently we studied 8 patients with different forms of progressive myoclonus epilepsy (secondary generalized epilepsy) exhibiting photosensitivity. Included are patients with Lafora disease, Kuf's disease, Renal Failure-Myoclonus Epilepsy Syndrome, Unverricht-Lundborg disease, Ramsay Hunt disease and with unclassified progressive myoclonus epilepsy.

Apomorphine 0.75 - 1.50 mg given subcutaneously blocked or significantly reduced epileptic photosensitivity in 6 out of 8 patients for 20-45 minutes without reducing intention myoclonus. Epileptic photosensitivity was abolished in 1 patient while on Bromocriptine (10 mg/day). Following cessation of this medication due to dyskinesia, the epileptic photosensitivity reappeared, thus providing additional evidence for a blocking effect of dopaminergic agonists in this condition.

Our findings suggest that a common dopaminergic mechanism participates in the genesis of epileptic photosensitivity in both primary and secondary generalized corticoreticular epilepsies.

Dopaminergic agonists did not modify intention myoclonus in patients with progressive myoclonus epilepsy, suggesting that this form of myoclonus has a physiopathogenesis different from that of epileptic photosensitivity.

92.

Familial Cavernous Hemangioma: An Autosomal Dominant Cause of Epilepsy

T. STAUNTON, E. ANDERMANN, F. ANDERMANN, W. FEINDEL and L.F. QUESNEY (Montreal, Quebec)

We wish to present a rarely encountered single gene disorder associated with epilepsy. Single or multiple cavernous haemangiomata were diagnosed in five members of a family, four of whom presented with seizures. A 22 year old man with a 14 year history of complex partial seizures had calcified lesions in the right temporal and right parietal lobes demonstrated by C.T. scan. His father had migraine and a single calcified lesion. A paternal uncle had a calcified frontal lesion and simple partial seizures. Another paternal uncle had partial seizures and died following rapidly progressive brainstem dysfunction; cavernous haemangiomata were found in his right hemisphere, pons, and cerebellum. The daughter of the deceased had seizures and multiple cavernous haemangiomata.

18 patients in five families - 10 female and eight male - have previously been described in the literature. Most presented with seizures or acute brainstem dysfunction related to hemispheric and brainstem cavernous haemangiomata.

The mode of inheritance of the disorder in these families, and in the one presently reported, is autosomal dominant. Awareness of a familial incidence of cavernous haemangiomata is important. This condition should be suspected in patients with seizures who are found to have intracranial calcified lesions and a family history of epilepsy. Computerized tomography has greatly facilitated the diagnosis of these lesions, and relatives of patients can thus easily be screened. The clinical, dermatological and radiological features should allow distinction from tuberous sclerosis.

The family histories of our previous patients with cavernous haemangiomata are presently being reappraised.

93.

The Relative Efficacy of Carbamazepine and its Epoxy Metabolite on Amygdala-Kindled Seizures in Rats

J. BRUNI and P. ALBRIGHT (Toronto, Ontario)

Recent reports have suggested that the major metabolite of carbamazepine, epoxy carbamazepine, has protective action against maximal electroshock seizures and hence may have anticonvulsant properties. The present investigation was designed (1) to determine whether the anticonvulsant action of the metabolite against kindled seizures is comparable to that of the parent drug, and (2) to assess the relative efficacy of the metabolite against partial and secondarily-generalized seizures triggered from the amygdala. This should provide some index of its activity against tonic-clonic and complex partial seizures in humans. Fourteen male Royal Victoria hooded rats received daily low intensity electrical stimulation in the basolateral amygdala until at least 10 stable secondarily-generalized seizures were produced. Three doses of carbamazepine and epoxy carbamazepine (12.5 - 50 mg/kg I.P.) were tested against the amygdala-kindled seizure in each animal. Both compounds readily suppressed the secondarily-generalized convulsion but blocked the partial seizure only at toxic doses. The parent drug and the epoxymetabolite were equipotent against both seizure types. This confirms the belief that the epoxymetabolite has anticonvulsant properties and suggests that it may exert a major therapeutic effect clinically.

94.

Transition from Spindles to Generalised Spike and Wave Discharges (SW) in the Cat: Unit Activity in Non-Specific and Specific Thalamic Nuclei

R.S. McLACHLAN and P. GLOOR (Montreal, Quebec)

Feline generalized penicillin epilepsy is a model of primary generalized epilepsy with 3/s SW in which cats given i.m. penicillin develop absence-like seizures associated with generalized 3-6/s SW. Previous studies showed that penicillin alters the cortical response to thalamocortical volleys from one of sleep spindles to generalized SW as a result of increased excitability of cortical neurons. In turn the cortex appears to entrain neurons in the specific thalamic nuclei into synchronous activity which may then facilitate cortical SW. To explore this further, recordings of single unit activity and of the EEG were made simultaneously in cortex, specific (n. lateralis posterior - pulvinar) and non-specific (n. centralis medialis) thalamic nuclei of 11 cats following i.m. penicillin and the results analyzed by computer.

The appearance of SW in the EEG always occurred first in the cortex or simultaneously in the cortex and specific thalamus. In the non-specific thalamic nuclei, if any change occurred, it appeared late as a series of rhythmic waves with occasional interspersed small spikes. In 2 animals, fully developed SW in cortex and specific thalamus was associated with EEG spindles in non-specific thalamus which later progressed to poorly developed SW.

Changes in unit activity were as previously described in cortex and specific thalamus. In both areas, firing probability gradually increased during the spindle waves which evolved into "spikes" of SW while "inhibition" of cell firing developed during the waves. These changes never occurred first in the thalamus. In non-specific thalamus, cell firing was often poorly correlated with the EEG and in 7 experiments random activity continued even during fully developed SW. In the other 4, a phasic discharge pattern developed but the fluctuations were small in comparison to those in cortex and specific thalamus. These began after the changes in cortex and specific thalamus.

Non-specific thalamic nuclei participate less than specific nuclei in generalized SW discharge.

95.

Facial Nerve Monitoring During Surgical Removal of Acoustic Neuroma

J.A. McLEAN, C.H. TATOR and J.M. NEDZELSKI (Toronto, Ontario)

Facial nerve preservation is of paramount importance during surgical removal of acoustic neuromas. However it is often difficult to visually identify the facial nerve intraoperatively, particularly with large tumors.

We have, therefore, developed a protocol for monitoring the facial nerve during acoustic neuroma removal.

Surface and needle electrodes are attached to the appropriate facial muscles following induction of the anaesthetic but prior to draping of the patient. Intraoperatively the facial nerve is identified by electrical stimulation of the intracranial portion of the facial nerve and recording the response from the appropriate facial muscles using a Disa EMG machine. Facial nerve function is assessed as needed throughout the surgery.

The protocol, technique, stimulus parameters and results will be discussed in detail. We conclude that this is an extremely useful procedure especially in large tumors with distortion of the brainstem. It is our opinion that it has resulted in a higher incidence of preservation of the facial nerve in these cases.

96.

Effects of Multiple Trauma on the Outcome of Spinal Cord Injury

K. MEGURO and C.H. TATOR (Toronto, Ontario)

We report the results of a retrospective study, relating the outcome of spinal cord injury to the presence of associated serious injuries. From 1974-79, 144 patients with spinal cord injury were admitted to the Acute Spinal Cord Injury Unit, Sunnybrook Medical Centre. Among them, 27 patients (19%) had other major injuries defined as grade 3 or higher by the Abbreviated Injury Scale including cerebral contusion, hemothorax, major intra-abdominal bleeding and fractured femur. These 27 patients (Group I) were compared to the remaining 117 patients (Group 2) who did not have other severe injuries.

There was no difference in age or sex distribution between the two groups. The incidence of hypotension on admission was higher in Group 1 (41%) than in Group 2 (7%) ($p<0.001$). Neurological grade on admission was assessed by the Sunnybrook Cord Injury Scale. In Group 1, 74% had either complete cord injury or incomplete injury with severe paresis, whereas only 58% of Group 2 had injuries of this magnitude. This difference was even more pronounced at discharge when 78% of Group 1 were in these categories as compared with 52% in Group 2 ($p<0.02$). The Sunnybrook neurological recovery index from admission to discharge (for example, 0% for no change, and 100% for recovery to normal neurological status) was 1.9% in Group 1 and 19.8% in Group 2 ($p<0.01$). Mortality during admission was 19% in Group 1 and 4% in Group 2 ($p<0.01$).

These results show that patients with spinal cord injury and major associated injuries have more severe initial neurological deficits, a higher mortality rate, and that the survivors show less neurological recovery than those with cord injury alone. The higher incidence of hypotension may play a significant role in the poorer neurological outcome.

97.

National Survey of Spinal Injuries Due to Hockey - Current Results

C.H. TATOR and V. EDMONDS (Toronto, Ontario)

To date the Committee on Prevention of Spinal Injuries Due to Hockey has received information on 42 hockey players who sustained major injuries to the spine and/or spinal cord while playing hockey. Approximately half the injuries occurred in 1981 and 1982 and the incidence appears to be rising. There were 41 males and one female, and the ages ranged from 11-45, with the median 17, and the average 20. Ontario had 26 injuries, Quebec three, Saskatchewan three, Manitoba three, Nova Scotia two, and one each in Alberta, B.C., P.E.I., Yukon, and U.S.A. There were 34 injured in an organized game. Striking the boards was the commonest mechanism of injury, and being pushed or checked from behind was frequently a factor. Helmets were worn by 37 of the players. Fracture-dislocation was present in 27, fracture in 9, dislocation in two, and four had no bony injury. Spinal cord injury occurred in 28, root injury in 5, and nine had no neurological deficit.

Numerous factors have been examined as possible causes for the increasing incidence of these serious injuries, and several recommendations regarding prevention can be made.

98.

Pathophysiology of Subarachnoid Hemorrhage (SAH) from Induced Cerebral Aneurysm in the Monkey

F. ESPINOSA, B. WEIR and T. NOSEWORTHY (Edmonton, Alberta)

We report a case of a 3 mm cerebral berry aneurysm (left ophthalmic-carotid artery) developing over a 2 month period in a 3.6 kg monkey (Macaca fassicularis) following accidental occlusion of the supraclinoid portion of the left internal carotid artery. SAH was created by direct puncture of the aneurysm through frontolateral craniectomy on day 0 and variables measured included cerebral vessel caliber on angiograms, cerebral blood flow (CBF), cranial CT scans, mean arterial blood pressure and neurological status. Severe cerebral vasospasm of all intracranial arteries was mild by day 2 but moderate by days 7 and 13. CBF dropped progressively from 65 to 15 ml/100g/min by day 13. CT scan showed diffuse SAH and a large clot in the right sylvian fissure area on day 0. The animal was lethargic, upright and unsteady with no significant neurological deficit from days 1 to 5, completely normal from days 6 to 9, and again severely obtunded and quadriparetic by days 10 and 11. Increased hemodynamic stress likely caused aneurysmal development in this monkey. If this method is reproducible, it will provide us with a very suitable experimental model of aneurysmal SAH. We will demonstrate the routine and electron microscopic findings. This rare case demonstrates that vasospasm can occur following aneurysmal rupture in non-human primates.

99.

Preoperative Embolisation of Vascular Supratentorial Meningiomas

J. RUTKA, P. MULLER and M. CHUI (Toronto, Ontario)

Preoperative embolization of the extracerebral vascular supply of intracranial meningiomas was carried out in 6 patients. All patients had pre-embolization CT scans compatible with the diagnosis of meningioma. Selective internal and external carotid angiography via the transfemoral route was used to confirm the radiographic diagnosis of meningioma. Superselective catheterization of the major external carotid feeding vessels was carried out and gel foam powder was embolized. Post embolization angiography was performed in each patient using the same contrast volume and injection sequence as the pre-embolization angiogram. The 6 patients ranged in age from 28 to 66 years. In two patients the tumour arose from the lateral sphenoid wing (pterion), in 3 from the fronto-parietal convexity and one from the middle fossa floor. The CT estimate of maximum tumour diameter ranged from 8.3 to 4.8 cm.

Post-embolization CT scans (4 cases) were taken 12-48 hrs after embolization. All showed alteration of the CT picture consisting of the development of low density areas within the previous hemogenously hyperdense meingioma. In two cases the changes were slight to moderate; in two cases the changes were dramatic with loss of 50-90% of the enhancement. In one patient surgery was delayed and followup CT 4 months later showed reduction in tumour size by 50% with a return of homogenous hyperdensity. Selective post-embolization angiography revealed extracerebral branch occlusions in every case. In 3 patients the external carotid meningioma blush disappeared and in 3 it was markedly reduced. Histologic examination in 5 cases revealed gel foam emboli within the meningioma vessels; in one patient whose surgery was delayed 4 months histologic examination revealed post ischemic fibrosis and vessel hyalinization.

Preoperative embolization of vascular meningiomas reduces the angiographically demonstrable tumour blood supply, results in development of low density zones within the meningioma on CT scanning and may improve surgical extirpation.

100.

The Relationship between Posttraumatic Ischaemia and Hemorrhage in the Injured Rat Spinal Cord as Shown by Colloidal Carbon Angiography

M.C. WALLACE, C.H. TATOR, P. FRAZEE and M.A. MARTIN (Toronto, Ontario)

The occurrence of ischaemia and intramedullary hemorrhages follow-

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ing experimental spinal cord injury has been well established. The purpose of this study was to document the changes in vascular filling of the intrinsic vessels of the rat spinal cord following an extradural clip compression injury. Colloidal carbon angiography with a new carbon suspension (Aquablak®) was employed.

Colloidal carbon angiography with Aquablak® was performed 15 minutes, 2 hours or 24 hours following the compression injury to twelve animals. The entire spinal cord was then removed, frozen and sectioned serially at 250 m. The sections were examined microscopically for patterns of ischaemia and hemorrhage at the site of compression injury, and at adjacent and remote sites in the cord. Computer assisted three dimensional reconstruction of serial sections was utilized to determine the relationship between hemorrhage and ischaemia at the lesion site and beyond.

Colloidal carbon angiography in the animals undergoing clip compression injury showed that ischaemia of the white matter occurred in areas supplied by arteries that traversed adjacent hemorrhagic grey matter. This study demonstrates the usefulness of a new colloidal carbon suspension for documenting the pathophysiology of posttraumatic ischaemia of the spinal cord. The results show that the ischaemia in the white matter is anatomically related to the hemorrhagic lesions found in the grey matter.

101.

Abstract Withdrawn

102.

Pentobarbital: Potentially Harmful in Head Injury

K. MEGURO and M. SCHWARTZ (Toronto, Ontario)

We report the results of a prospective, randomized, controlled trial, comparing Pentobarbital and Mannitol in the outcome and the control of intracranial hypertension following severe closed head injury. Entry criteria included intracranial pressure (ICP) of 25 torr or higher and Glasgow Coma Scale of 7 or less. The patients were divided into two categories, those who underwent evacuation of intracranial hematomas and those who did not have intracranial hematomas. In each category, the patients were randomly assigned to one of two treatments; Mannitol or Pentobarbital as an initial treatment. When the first regimen failed to control ICP, the second treatment was added. This was regarded as a treatment failure of the first medication. The treatment given to both groups was identical in all other aspects.

Sixty patients entered the study, 30 patients for each category. In the patients with intracranial hematomas, there was no difference in mortality between the Pentobarbital and Mannitol group, 33% and 40% respectively. However, the treatment failure was more frequent in the Pentobarbital group, 60% of whom required the second medication, whereas only 33% of the Mannitol group required the second treatment.

A striking difference in mortality was noted in "non-hematoma" patients. Seventy-seven percent of the Pentobarbital group died as compared to 41% of the Mannitol group. Treatment failure of the first medication was seen in 61% of the Pentobarbital group and 41% of the Mannitol group. Among the patients who were treated with two medications, ICP control was obtained more frequently in patients who received Pentobarbital as the second medication rather than as the first.

The results indicate that Pentobarbital coma is not only less effective than Mannitol in controlling raised ICP, but may also cause higher mortality in patients without intracranial hematomas. Pentobarbital should be reserved for those cases in which Mannitol has failed to control ICP.

103.

Subdural Empyema - Analysis of 15 Cases

M.I. KHAN, R. GRIEBEL and G. VARUGHESE (Saskatoon, Sask.)

This presentation is based on an analysis of 15 patients with subdural empyema admitted to the University and Saskatoon City Hospitals between 1956 and 1982. The clinical features, diagnostic studies, bacteriological cultures, treatment and results are evaluated. There were 11 males and 4 females. Twelve patients were under 50 years old. Paranasal sinusitis in 6 patients was the most common cause. The most frequent clinical features at presentation included fever, headache, vomiting, seizures and motor deficit. Preoperative diagnostic studies included skull x-rays, cerebrospinal fluid studies, EEG, cerebral angiography, and computerized tomographic scanning. Positive cultures were obtained from the empyema fluid in 14 of the 15 patients. Drainage of the empyema was accomplished by multiple burr holes in 10 patients, craniotomy in 4 patients and craniectomy in 1 patient. Follow-up ranged from one month to 15 years. Two patients died while 2 suffered from permanent major neurological deficits.

Eleven patients recovered with minimal or no deficit. However, 50% of patients suffered from seizures for several years after their illness.

We conclude that successful management of subdural empyema is directly related to early diagnosis, prompt evacuation of the pus and administration of specific antibiotic (s) appropriate to the organism (s) cultured.

104.

Low Grade Astrocytoma: Induction by Focal Low Dose Scalp Radiotherapy in Infancy

D.W. ZOCHODNE, F.P. ARCE, J.C.E. KAUFMANN, W.T. BLUME, J.P. GIRVIN and J.G. CAIRNCROSS (London, Ontario)

A twenty-four year old woman with a fifteen year history of intractable focal seizures underwent resection of a small low grade astrocytoma of the right mesial frontal lobe. The tumour arose immediately beneath a benign scalp nevus that had been treated in infancy with radium patches and focal X-irradiation. Neuropathological changes within and surrounding the tumour were compatible with radiation injury. The demonstration of a coexistant astroglial tumour and tissue changes consistent with radiation effect twenty-four years after scalp irradiation is unique. Meningiomas and sarcomas are a recognized complication of cranial irradiation but astrocytomas have only rarely been reported. Our observations support an association, intimated by others, between radiation exposure and the subsequent development of astroglial tumours. Previous reports of radiation associated astrocytomas are reviewed.

105.

Familial Intracranial Gliomas

F.B. MAROUN, J.C. JACOB, G. MURRAY, A. CLARKE, W.D. HENEGHAN, M. MANGAN, S. ALI and N.A. RUSSELL (St. John's, Newfoundland)

The pedigree of two interrelated families with ten affected members suffering from malignant supratentorial gliomas is presented. In addition, mention is made of three other unrelated families, with two members each, who were treated for diffferent types of brain tumors. Genetic implications are discussed.

106.

Cervical Spine Injuries: Analysis of 350 Cases

M.I. KHAN, R. GRIEBEL and K.W.E. PAINE (Saskatoon, Sask.)

This presentation is based on an analysis of 350 patients with fractures or fracture dislocations of the cervical spine, treated at the University Hospital, Saskatoon, since 1956. The first part of this study concerns the general features of these injuries in relation to the mechanism and type of injury, age, sex and neurological involvement. The second portion deals with the management of the bone injury and reviewing the methods that were used in the treatment of these patients at different levels of injury with recommendations as to the best management for each type of injury. The methods of treatment included the use of a simple cervical collar, Minerva cast, skull traction, Halo traction apparatus, posterior fusion and anterior cervical fusion. Specific management of the quadrilegic patient is not defined, except where the presence or absence of cord damage may have some bearing on the management of the bony injury.

We conclude that the principles of managing the bony injury should be early realignment and fixation, using a method that will allow early ambulation or an early start on the rehabilitation program but also allow return of good cervical spine movement.

107.

Delayed Recognition and Referral of Cases of Subarachnoid Hemorrhage

W.S. TUCKER, C. LAMBERT, W.M. LOUGHEED, R.G. PERRIN, D.W. ROWED, R.G. VANDERLINDEN, C. CORRADO and A. MONGUL (Toronto, Ontario)

The adult neurosurgical units in the University of Toronto have kept records of all cases of subarachnoid hemorrhage (SAH) admitted since January, 1981, as part of an ongoing study (The International Cooperative Study on Timing of Aneurysm Surgery). As of November, 1982, 450 cases of SAH had been admitted. 179 patients were male (39.8%) and 271 were female (60.2%). A delay of more than 3 days from the time of SAH until admission to a neurosurgical unit occurred in 88 cases (19.6%). 22 patients (4.9%) died without an angiographic diagnosis or autopsy, but were shown by CT scan or lumbar puncture to have had SAH. In 51 surviving patients (11.3% of cases), no cause for SAH was identified by full cerebral angiography and CT scan. 347 patients (77%) had at least one intracranial aneurysm. 32 patients (7.1%) had another identifiable cause for SAH: 2 patients had an arteriovenous malformation (AVM) as well as an aneurysm; 24 patients (5.3%) had an AVM; 3 patients had a fusiform intracranial aneurysm; one patient each had a brain tumour, cranial arteritis, and spontaneous dissection of an intracranial artery.

The delayed recognition and referral of cases of SAH still limit optimal management. As improved neurosurgical treatment reduces the incidence of rebleeding and the harmful effects of vasospasm, efforts must be made to improve professional and public awareness of SAH, to allow application of improved management to a greater proportion of those afflicted.

108.

Cerebral Hyperperfusion after Carotid Endarterectomy Causing Unilateral Hypertensive Encephalopathy

M. BERNSTEIN, J.F.R. FLEMING and J.H.N. DECK (Toronto, Ontario)

Correction of high grade carotid stenosis by endarterectomy may result in an increase in cerebral blood flow to well above normal values, with hyperperfusion of a cerebral hemisphere that had been adapted to low perfusion and had previously been functioning normally. Sundt had reported blood flow increases of two or three times the pre-operative values, with mean post-operative flow rates in some cases as high as 85.5 ml/100 g/min., suggesting paralysis of autoregulatory mechanisms, and lasting for several days; retinal artery pressures were greatly increased during the period of cerebral hyperperfusion. Symptoms of hyperperfusion include seizures, unilateral migraine-like pain in the frontotemporal region, face and eye, and intracerebral hemorrhage.

While migraine-like pain is fairly common following endarterectomy, its relationship to hyperperfusion is not widely recognized, and the triad of seizures, migraine and intracerebral hemorrhage in one patient has not been reported. Following correction of an extremely tight carotid stenosis, a previously normotensive and neurologically normal patient developed seizures on the second day, and continuous severe ipsilateral facial, ocular and temporal pains requiring narcotic analgesia; he remained neurologically normal until a massive intracerebral hemorrhage occurred on the sixth day. At post mortem there were perivascular red cells, fibrin exudates and polymorphonuclear infiltrates, and fibrinoid necrosis of vessel walls in the involved hemisphere; the opposite hemisphere was normal. The carotid artery was patent. A severe unilateral hypertensive encephalopathy had thus been caused by post-operative hyperperfusion in the presence of normal systemic blood pressure.

The authors wish to draw attention to this syndrome, and to the potentially serious implications of post-endarterectomy seizures and migraine-like pain.

109.

Shunt Survival: A Computer Analysis of Contributing Factors

R. GRIEBEL, A.B.O. ADEGBITE, M.I. KHAN and L.K. TAN (Saskatoon, Sask.)

One hundred three consecutive patients underwent 195 ventricular CSF shunting procedures at the University Hospital, Saskatoon between January, 1975 and October, 1982.

We attempted to define the factors responsible for the survival of these shunting systems by selecting a series of parameters and correlating these with post-operative complications and overall shunt longevity.

The underlying pathological condition requiring shunting was shown, with a single exception, not to have a predisposing influence on ultimate shunt survival.

Intraoperative prophylactic antibiotics were administered in 75% of all insertions, but their use, contrary to other published data, did not appear to influence the frequency of post-operative complications.

The relationship between the length of surgery and subsequent infection rate and revision rate was examined.

There was found to be significant variations in the complication rates of the 5 neurosurgeons who inserted the shunts. Further refinements of the data explain some of these discrepancies.

One hundred seventy-eight of the 195 shunts inserted or revised were ventriculo-peritoneal. Of these the single component (Codman Uni-shunt) system was used in 36 instances and the remainder were multicomponent systems. The median over-all shunt survival time was 13.1 months, however a significant difference between the survival of the various shunting systems was apparent on a life table analysis.

110.

Sensory Nerve Versus Mixed Nerve Stimulation in the Diagnosis of Multiple Sclerosis

S.J. PURVES and A. EISEN (Vancouver, B.C.)

Somatosensory evoked potentials (SEPs) elicited by mixed nerve stimulation are useful in the diagnosis of multiple sclerosis (MS). Stimulation of a cutaneous nerve may be more sensitive, but spinal evoked potentials become more difficult to elicit. In 35 patients (13 definite MS, 11 possible MS, 7 optic neuritis, and 4 non-MS), mixed and cutaneous nerve stimulations were compared. In 17 patients both methods gave normal SEPs and in 9 abnormal SEPs. Cutaneous nerve stimulation only was abnormal in 4 whilst mixed nerve stimulation only was abnormal in 5. We conclude there is no advantage to using cutaneous nerve stimulation to elicit SEPs in evaluating patients with MS.

In another group of 35 patients with definite or suspected MS, the frequency of abnormal SEPs elicited by upper limb (median nerve) and lower limb (posterior tibial nerve) stimulation were compared. Leg stimulation approximately doubled the yield and is considered the most useful SEP in MS diagnosis.

111.

Visual Evoked Potential Latency: Does it Predict the Development of Multiple Sclerosis in Patients with Optic Neuritis?

I. HEINRICHS and D.R. McLEAN (Edmonton, Alberta)

The visual evoked potential (VEP) latency was measured in 47 patients with acute optic neuritis, and in all patients, the latency was found to be either abnormally prolonged or absent, in the involved eye. The mean latency in the involved eye was not significantly different in 22 patients with known multiple sclerosis (M.S.), as compared to 25 patients who did not have clinical evidence of M.S. Follow-up clinical assessment and evoked potentials were done 10 to 24 months later in 34 patients. Of 16 patients who originally had only optic neuritis, 5 had developed clinical evidence of M.S.. The original and follow-up VEP latencies of the 5 patients who subsequently developed M.S. were not significantly different from the 11 patients who did not have clinical evidence of M.S. at follow-up.

Normalization of the VEP latency occurred in 12 of 34 patients (34%), the proportion being similar in M.S. and non-M.S. groups.

In 15 of 34 patients (44%), the original VEP response was absent. On retesting, 14 of the VEP responses had a measurable latency, and 6 of the latencies were normal. Our study showed that an absent response generally reflected the stage, and not simply the severity, of the disease.

112.

Serial Pattern Shift Visual Evoked Responses (PSVER) in Multiple Sclerosis (MS)

W.J. BECKER, I. RICHARDS and T.P. SELAND (Calgary, Alberta)

40 Patients with M.S. initially tested in our laboratory were recalled for repeat PSVER testing approximately 2 years later (mean 21 months, range 4 to 36). 12 normal controls were tested twice in a similar manner approximately 2 years apart (mean 23 months, range 12 to 39).

The PSVER positive peak latency changed little in the 24 control eyes (mean 1.4 msec, range 0 to 6) over the study interval.

Most M.S. patient eyes also showed little change in PSVER latency over the 2 year study interval. 58 eyes changed 8 msec or less. 18 eyes, however, showed a PSVER latency increase of 10 msec or more (mean 23 msec, range 11 to 52). 6 of the 18 eyes were symptomatic (attack of clinical optic neuritis), 12 asymptomatic during the study interval.

Significant latency increases occurred with equal frequency in previously normal eyes (normal PSVER on first test) and abnormal eyes (abnormal PSVER on first test or previous clinical optic neuritis).

Significant latency increases occurred with greater frequency in patients with a mixed or progressive course than in patients with a remitting-relapsing course ($p<.05$); and in patients with greater disability ratings (Kurtzke 3 to 7) than in patients with lower disability ratings (Kurtzke 0 to 2) ($p<.05$).

4 eyes, all with onset of acute optic neuritis in the 5 weeks preceding the first PSVER test, decreased in latency by 10 msec or more (range 10 to 30) during the study interval.

In our M.S. patients, 13% of eyes per year developed latency increases of 10 msec or more. These may represent new demyelinating lesions. If so, one third of these lesions were clinically symptomatic.

113.

Agarose Isoelectric Focusing: An Improved Method for the Detection of Oligoclonal Bands in CSF

L. VOULTERS, G.C. EBERS, A. ARMSTRONG and B. BASS (London, Ontario)

Isoelectric focusing (IEF) is a promising new technique which will demonstrate oligoclonal IgG bands (OB) in CSF with high resolution and greater sensitivity than agarose electrophoresis (AEP).

IEF generally employs polyacrylamide gel whose major drawbacks, limiting the usefulness of the technique, include a high degree of false positive results and toxicity. These problems are largely eliminated using agarose especially developed for IEF.

For comparison of the two methods AEP and agarose IEF were performed on the CSF of 209 patients. These were divided into three categories: MS (n=58), possible MS (n=100) and non-MS (n=51). Results were classified as positive (OB+), negative (OB-) and indefinite (IND) for oligoclonal banding.

IEF was a more sensitive method for the detection of OB in the MS group (IEF 89.7%; AEP 84.5%) and the possible M.S. group (IEF 38%; AEP 22%). However, the most important difference between these two methods was the high degree of resolution with IEF of results IND by AEP (MS 8.6%, possible MS 21%, non-MS 19.6%). Unequivocal IEF results were obtained in all the MS and non-MS IND's and in 95% of the possible MS IND cases. In addition 6% of the possible MS group OB- on AEP converted to OB+ on IEF, a much high conversion rate than the other two groups. In the possible MS group both the increase in OB+ and the conversion of indefinites were statistically significant ($p<0.005$).

Because of its increased sensitivity and high resolution we recommend agarose IEF as the method of choice for detection of CSF IgG oligoclonal bands.

114.

Incidence and Prevalence of Multiple Sclerosis in Newfoundland and Labrador: Baseline Results

W.E.M. PRYSE-PHILLIPS, S.D. COOK and B. GALWAY (St. John's, Newfoundland)

Using the available means of data collection, the incidence and prevalence of Multiple Sclerosis were studied in this Province with special reference to geographical onset patterns.

On prevalence day (30 November 1982), 241 cases of clinically definite/clinically probable multiple sclerosis were known to reside in the Province, giving a rate of 42.2/100,000. Patients with optic neuritis and with possible multiple sclerosis were excluded from consideration. Area-specific prevalence rates varied from a high value of 101.4/100,000 (females, St. John's area) to a low of 6.9/100,000 (males, south coast). Age specific prevalence rates peaked in females at ages 30-39 years (134.4/100,000) while males reached a lower peak at a later age (98.2/100,000 at 40-49 years). Annualised overall incidence rates showed two peaks of increased incidence in recent years (3.77/100,000, 1975; 3.17/100,000, 1981). Rates in both previous and intervening years were substantially lower. The peak incidences consistently occurred on the main part of the island two years earlier than on the Avalon peninsula.

Although the highest rates were found in the University city, the next highest were detected in the central part of the island, 300 miles away and served by a single General hospital. The most obvious reason for the distinct regional disparities, namely variation in the availability of medical services, only partially explains the skewed incidence and prevalence figures. The local and environmental factors likely to have influenced this unusual distribution will be discussed.

115.

The Multiple Sclerosis Programme for British Columbia: Preliminary Report on Prevalence

V.P. SWEENEY, A.D. SADOVNICK and V. BRANDEJS (Vancouver, B.C.)

A broad epidemiological study has begun in B.C. designed to examine the role of environmental and genetic factors in the causation and natural history of MS. The initial phase is a prevalence study to identify current cases and to establish an incidence register. The major portion of the prevalence study is a review of all the files of all neurologists in the province, judged to be the most accurate source of identification. This study will be completed in the summer of 1983.

As of January 1983, over 100,000 files, representing those of half of the province's neurologists have been searched by a single researcher using the Schumacher criteria of classification. Preliminary data from this

source alone taking into account a 12% duplication of cases amongst neurologists, are as follows:

		Prevalence 100,000 population	Cummulative Prevalence 100,000 population
Total files reviewed	101,102	—	—
Definite & probable MS	1,201	96	96
Possible MS	428	34	130
Optic Neuritis only	184	15	145

These prevalence rates are amongst the highest reported in Canada or elsewhere. We feel that this method of ascertainment allows more accurate diagnosis and the identification of early cases which are important for prospective epidemiological and clinical studies. It also affords the opportunity to assess inter-neurologist variation and disagreement in diagnosis and classification.

116.

Validation of a Diagnostic Sign in Carpal Tunnel Syndrome

W.E.M. PRYSE-PHILLIPS, G. BEAUFIELD and R. LeDREW (St. John's, Newfoundland)

The clinical features of Carpal Tunnel Syndrome (CTS) are already fully described, yet diagnostic errors persist in patients referred to an EMG Service. Among 215 unselected patients with electrically-verified CTS and a further 124 patients with other brachial pathologies, a clinical sign was sought which is based upon the occasional reference to the "shaking" of the affected hand by patients with CTS. When asked what they did with their hands when symptoms were at their worst, those who showed the sign made a flicking/rotatory movement of the wrist(s), similar to the movement made when shaking down a clinical thermometer.

This sign was spontaneously produced by 191 of 215 patients with CTS, 2 of 34 with Thoracic Outlet syndromes, one of 50 with ulnar nerve compression and none of 40 patients with Cervical Spondylosis. No correlation with age, sex, side affected, dominance nor the presence or absence of systemic or local pathologies could be found.

The sign is presented as valid and reliable evidence of CTS. Its pathophysiology is discussed in the light of the theories of etiology of CTS and of the known anatomy of the median nerve.

117.

Encephalopathy and Axonal Neuropathy due to Disulfiram

D. BORRETT, J. BILBAO and P. ASHBY (Toronto, Ontario)

Disulfiram ("Antabuse"), which is used in the treatment of alcoholism, is known to cause a peripheral neuropathy and encephalopathy. These complications can be seen with the usual therapeutic doses (250-500 mg. daily) of the drug and usually occur within weeks or months after the initiation of therapy. This report concerns a patient who took 250 mg. of Disulfiram daily for 30 years and who developed a peripheral neuropathy and encephalopathy of extremely insidious onset. Conduction studies and nerve biopsy confirmed the presence of an axonal neuropathy. Psychological testing showed severe depression of intellectual performance. The Disulfiram was discontinued. There was gradual improvement in his intellectual function, documented by a repeated psychological testing, and some improvement in the peripheral neuropathy documented by repeated conduction studies.

This case emphasizes the need for continuous supervision of all patients who are prescribed Disulfiram. The neurological complications of Disulfiram will be reviewed.

118.

Sensory Nerve Conduction Studies in Cervical Root Lesions

M. BRANDSTATER and M. FULLERTON (Hamilton, Ontario)

The purpose of this study was to assess the value of sensory nerve conduction studies in the diagnosis of root lesions in the upper limb. The results of electromyography and nerve conduction studies have been analyzed in all patients with cervical root lesions seen over a period of 5 years. Of 249 patients, 100 had definite clinical and EMG features of a cervical root lesion. In 19 of those patients a second lesion was present, e.g. CTS or polyneuropathy. The results of sensory nerve conduction studies were reviewed in the remaining 86 patients with a definite but uncomplicated cervical root lesion. In almost all cases, sensory nerve conduction studies were normal, the amplitudes and latencies of nerve action potentials being within normal limits. Amplitudes of the nerve action potentials were reduced in only 5 patients. By contrast, those patients with an additional peripheral lesion frequently showed low amplitude or absent responses, or slowing of conduction.

It is concluded that sensory conduction studies provide data of significant diagnostic importance in patients presenting with neurological lesions of the upper limb. A patient with suspected cervical root lesion who has abnormalities on sensory conduction studies probably has in addition a peripheral nerve lesion.

119.

How Useful is the Somatosensory Evoked Potential (SEP) in Evaluating Radiculopathies?

A. EISEN, M. HOIRCH, A. MOLL and G. GIBSON (Vancouver, B.C.)

Sensory symptoms or signs may predominate or occur in isolation in radiculopathies. Somatosensory evoked potentials (SEPs) may then prove useful, whereas needle electromyography (EMG) and F-waves, reflecting solely motor disturbances are likely to be normal. Thirty-six patients with presumptive radiculopathies were studied by EMG of paraspinal and limb muscles, F-waves and SEPs. They were elicited by segmental sensory stimulation allowing evaluation of individual cervical and lumbosacral roots.

TABLE

Clinical Deficit	Number of Patients	Number (%) with any Abnormal Test	Number with Abnormal EMGs	Number with Abnormal F-Waves	Number with Abnormal SEPs
Motor and sensory	17	14 (82%)	12/14	7/14	9/14
Motor only	4	4 (100%)	4/4	2/4	1/4
Sensory only	6	4 (67%)	1/4	1/4	3/4
Pain only	9	6 (67%)	4/6	2/6	3/6
Total	36	28 (78%)	21/28 (75%)	12/28 (43%)	16/28 (57%)

Myelography was abnormal in 25/30 (83%) of cases. We conclude the different tests are complementary. Abnormal EMGs correlate best with motor deficit and abnormal SEPs correlate best with sensory deficit. But the EMG is abnormal in the majority of patients with a radiculopathy who are going to have abnormal electrophysiology.

120.

Dysautonomia with Massive Rosenthal Fibre Formation and Glial Hamartomas

R.F. NELSON, V. MONTPETIT and G. CANTU-REYNA (Ottawa, Ontario)

Rosenthal Fibers have been reported in several neurological conditions but only once described in dysautonomia. We present a

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clinicopathological study in a 45-year-old female with a family history of cystic fibrosis who died of respiratory arrest after 2 years of recurrent episodes lasting days to weeks of respiratory irregularity, hypothermia (33°C) and bradycardia. Scoliosis and miosis had been present for decades and prior to death spastic paraparesis, palatal myoclonus and features of dysautonomia were found. The results of extensive investigations of autonomic function and electrophysiological studies will be presented.

At autopsy, multiple glial hamartomas were found in the subependymal areas of the third and lateral ventricles and aqueduct. The most prominent feature, however, was a profusion of Rosenthal Fibers in the optic chiasm, anterior hypothalamus, hippocampus, cerebellum, brain stem and spinal cord, where they were located particularly in the grey matter in the dorsal and lateral horns. Cell loss was noted in the dorsal and lateral horns and in the sympathetic ganglia. Symmetrical cavitory degeneration was also noted in the medial globus pallidus bilaterally.

Rosenthal Fibers have been linked to a variety of pathological processes and have been produced experimentally by implantation of nickel which is felt to interfere with the metabolic pathway responsible for the formation or degradation of astrocytic filaments. The underlying basis in our case remains obscure but the case is presented because of extensive ante-mortem neurophysiological investigations which correlate with neuropathological findings.

121.

Perineuroma

N. KHOURY, J. BILBAO and A.R. HUDSON (Toronto, Ontario)

From the University of Toronto Peripheral Nerve Tumour Series four cases of a controversial pathological entity of peripheral nerves are presented. Fifteen reported cases in the literature are reviewed. Previous reports have debated whether this is a hypertrophic condition of Schwann cells or a true neoplasm.

The four cases reported presented with a painless, slowly progressive, localized peripheral nerve deficit. Physical findings varied according to the nerve involved. Three of the four cases had undergone previous surgical exploration and no specific diagnosis was made. Nerves affected by clearly defined masses were the posterior interosseous, median and posterior fibial nerves and the brachial plexus. Gross pathology revealed a diffusely enlarged nerve. Light and electron microscopy demonstrates preservation of the fascicular pattern with enlargement of each fascicle. Hypercellularity with onion bulb formation is characteristic of each tumour histology.

Discussion of the clinical course and pathological findings of all reported cases leads us to the conclusion that this is a benign neoplasm of peripheral nerves. We believe that the cell of origin is the Schwann cell.

1. Peckham et al. - Hypertrophic Mononeuropathy, Arch. Path. Lab. Med., Vol. 106, October, 1982, p.534-7.
2. Mitsumoto et al. - Perineuroma as the cause of localized hypertrophic mononeuropathy, Muscle & Nerve 3: September/October, 1980, p.403-12.

122.

Diaphragmatic Paralysis as the Initial Manifestation of Infantile Spinal Muscular Atrophy: A Unique Clinical Syndrome

P. HUMPHREYS and C. JIMENEZ (Ottawa, Ontario)

A 5 week-old previously well infant presented with acute respiratory failure. Investigations revealed paralysis of both diaphragmatic leaflets, but no other neurological abnormality. Chronic respiratory failure ensued necessitating long-term mechanical ventilation via tracheostomy. At age $4^1/_2$ months the baby began to show progressive limb weakness and became areflexic. Nerve conduction studies showed a severe axonal degenerating neuropathy involving both motor and sensory fibres. A gastrocnemius biopsy revealed marked fibre atrophy, rounding of larger fibres and fibre type grouping consistent with Werdnig-Hoffmann disease. The adjacent sural nerve, however, showed complete absence of large myelinated fibres (single 4 μ diameter peak), occasional demyelinated fibres and no inflammatory changes.

Werdnig-Hoffmann disease typically spares the phrenic motor neurones until late in the clinical course; sensory nerves are normal except for occasional Wallerian ovoids. Mellins et al (1974) described two infants with a clinical course identical to our patient; post-mortems showed typical CNS changes of Werdnig-Hoffmann disease; no mention was made of sensory nerves. It is our hypothesis that, based on the very atypical clinical course and the additional evidence of profound sensory nerve involvement, our patient has a unique syndrome distinct from Werdnig-Hoffmann disease.

123.

Acute Lumbosacral Plexus Neuropathy Following Vascular Surgery

L. VOULTERS and C. BOLTON (London, Ontario)

A 62-year-old man awoke from anesthesia with severe weakness, numbness and burning pain of the left leg following repair of an abdominal aortic aneurysm with an aortofemoral bypass graft. A 62-year-old woman had an intra-aortic balloon inserted via the left femoral artery during surgery to replace her mitral valve. Immediately afterward she also experienced numbness, weakness and burning pain of the left leg. Clinical and electrophysiological studies indicated severe axonal damage to the lumbosacral plexus affecting predominantly, in the first patient, obturator, femoral and sciatic nerves. Follow-up studies have shown slow but progressive recovery, consistent with axonal degeneration.

The clinical and electrophysiological features are consistent with acute ischemic nerve damage which was induced in some way by surgical manipulation of major vessels which supply the lumbosacral plexus. These two occurrences are presumably extremely rare, but they have both practical and theoretical implications.

124.

Electrophysiological Studies in Five Cases of Abetalipoproteinemia (Bassen-Kornzweig Disease)

N.J. LOWRY, M.J. TAYLOR, W.M. BELKNAP and W.J. LOGAN

Auditory brainstem responses (ABRs), visual evoked responses (VERs), somatosensory evoked responses (SERs) and motor and sensory nerve conduction studies were conducted in 5 patients with abetalipoproteinemia. This is a rare autosomal recessive condition characterized by malabsorption, absent serum betalipoprotein, low serum cholesterol (<100 mg%) acanthocytes in peripheral blood and a characteristic progressive neurological syndrome of ataxia, peripheral neuropathy and retinal degeneration. Pes cavus and scoliosis have been frequently reported in this condition which makes a purely clinical differentiation from Friedreich's ataxia difficult.

The ABRs were normal in all cases. The VERs were of normal amplitude but of increased latencies in 2/5. The 4 eldest patients had delayed cortical SERs but normal peripheral SERs which is evidence of delay in central conduction time. The peripheral motor conduction velocities were normal in all cases. The peripheral sensory studies showed normal velocity when a response was seen; however, the amplitude of the response was often reduced or it was absent.

The peripheral neuropathy in abetalipoproteinemia is felt to be similar to that in Friedreich's ataxia - progressive loss of large myelinated fibres. The entity is felt to be primarily a loss of axons with secondary demyelination. Our finding of normal peripheral nerve conduction velocities but with a reduced amplitude of sensory potentials and eventual disappearance of sensory potentials lends electrophysiological support to this concept. Both SER and VER abnormalities in abetalipoproteinemia are similar to those found in young patients with Friedreich's ataxia. This further supports the model of axonal loss with secondary demyelination. However, the normal ABRs in abetalipoproteinemia electrophysiologically differentiates these patients from Friedreich's ataxia, who show a progressive loss of ABR waveforms. This finding is most likely due to a different anatomical distribution of the pathological process.

125.

Carcinomatous Versus Radiation-Induced Brachial Plexopathy in Breast Cancer

R. RUTHERFORD and J.J.E. TURLEY (Toronto, Ontario)

Ten patients with presumed radiation plexopathy and 20 patients with metastatic infiltration of the brachial plexus were studied retrospectively for differentiating features. Anatomical localization within the plexus was based upon EMG data. In both groups, the most common site of involvement was the lower trunk of the plexus. Differentiation based upon the clinical profiles of the two groups proved to be more useful. The mean symptom free interval from the initial diagnosis of cancer was 7.0 years in the metastatic group and 15.2 years in the radiation group. Onset with severe shoulder pain or the presence of a Horner's syndrome was only seen in the metastatic group and occurred in 50% of patients. Painless paresthesia of the hand was the presenting symptom in 60% of patients with radiation injury. Progression to a flail arm was common to both groups but occurred much more rapidly with metastatic plexopathy. All patients with radiation injury are alive with a mean follow-up of 5.0 years. Seventy-five percent of the metastatic plexopathy patients are dead with a mean survival interval of 2.2 years. The diagnosis of metastatic infiltration of the brachial plexus may be made with relative certainty on clinical grounds. This is significant for it implies a grave prognosis and warrants palliative therapy.

126.

Spinal Accessory Nerve Injury Following Minor Surgery in the Posterior Triangle

B. TRANMER and A.R. HUDSON (Toronto, Ontario)

Spinal accessory nerve injury occurs during minor surgical procedures in the posterior cervical triangle. From a series of 255 cervicobrachial nerve injuries, 13 iatrogenic spinal accessory nerve injuries were found. Eleven injuries followed lymph node biopsy and two followed resection of benign lumps. Three injuries recovered spontaneously, nine required exploratory surgery, and one injury could not be considered for surgery because of time delay. During surgery, six accessory nerves were found transected and three were intact, but embedded in scar tissue. Seven nerve grafts, one end-to-end anastomosis and one external neurolysis were performed. Good shoulder function was regained in six of these surgical patients. Results suggest that if the spinal accessory nerve is accidentally injured, the prognosis for recovery of trapezius function can be good. The medical/legal implications of this injury will be discussed and technical strategies for repair illustrated.

127.

Demyelinating and Axonal Hereditary Motor Sensory Neuropathy - A Genetic Overlap?

J.M. DOOLEY and G.V. WATTERS (Halifax, Nova Scotia)

Previous investigators have challenged the division of Hereditary Motor Sensory Neuropathy (HMSN) into genetically distinct demyelinating (HMSN I) and axonal (HMSN II) groups. From a study of 32 patients (whose clinical and electrophysiological characteristics will be presented) we have discovered 2 families with features suggesting an overlap between HMSN I and HMSN II.

In family A, a 37 year old symptomatic man had a median motor nerve conduction velocity (MNCV) of 50 m/sec. (HMSN I). His 4 year old daughter had a MNCV of 34 m/sec. and evidence of segmental demyelination on sural nerve biopsy (HMSN I). In family B there were 4 members with HMSN I and one patient with HMSN II, as judged by MNCV.

Clinically the 5 HMSN I patients had an earlier onset and more severe weakness than those with HMSN II.

Sural nerve biopsies were obtained in 10 patients and in 9 correlated with the MNCV criteria proposed by Harding and Thomas (Brain 103: 258-280, 1980). The remaining patient, from a third family, had biopsy evidence of segmental demyelination, despite a median MNCV of 44 m/sec. at $3^1/_2$ years of age.

These findings show that axonal and demyelinating HMSN may coexist within the same family, suggesting a disease spectrum. Because an occasional patient may show a discrepancy between histological and MNCV findings, a sural nerve biopsy should be performed to confirm the disease type as an indicator of prognosis.

128.

Recessively Inherited Congenital Muscular Dystrophy with Microcephaly

J.A.R. TIBBLES, P.R. CAMFIELD and L.A. MARSH (Halifax, Nova Scotia)

Three children from 2 families suffer from congenital muscular dystrophy combined with microcephaly and developmental retardation.

A.C., a $3^1/_2$ year-old girl, presented at 10 months age with severe hypotonia, predominantly proximal and facial weakness, microcephaly and socio-adaptive as well as motor delay. CPK was 5180 units (normal = under 150 units), electromyography was consistent with a myopathy and biopsy showed changes of a marked dystrophy with necrosis and regeneration. CT scan was non-contributory and no independent cause was found for the microcephaly. She has remained weak and retarded although there has been some developmental progress and the head circumference follows the growth curve.

The other 2 girls both show similar history and physical findings including abnormal muscle enzymes (CPKs 5680 and 2286), abnormal EMG and biopsy. All 3 come from the same small community, are of Acadian ancestry and are distantly related.

Recognition of the recessive nature of the condition will allow genetic counselling. This combination of findings has not been reported before. There is an association between other types of cerebral abnormality and some congenital muscular dystrophies. It may be that a single genetic defect has caused a static brain lesion with microcephaly and a progressive muscular disorder.

129.

A New Syndrome of Exercise-Induced Muscle Rippling, Muscle Hypertrophy and Cramps

D. HYLTON, P. HUMPHREYS, D. KEENE (Ottawa, Ontario) and C. SIMPSON

Limb myokymia is an unusual and rare disorder. The pathophysiology is poorly understood. This paper discusses a family in which myokymia presents with cramps and elevated creatine kinase (C.K.).

A sixteen year old boy presented with a longstanding history of muscle cramps and stiffness at rest or following exercise. These symptoms were more marked in the legs and improved during exercise. Examination showed generalized muscular hypertrophy. Rippling of the muscles occurred when they were voluntarily contracted. This resembled myokymia, but it did not occur spontaneously. Muscle power was normal and except for percussion myotonia of the thenar eminence, there was no other evidence of myopathy or neuropathy.

Electrolytes and ischemic lactate curve were normal, but the C.K. was persistently elevated Ω 1100 I.U. with no myoglobinuria. Muscle biopsy was negative. E.M.G. showed no spontaneous myokymic discharge or increased activity on muscle percussion. The contraction induced "myokymia" consisted of summated individual muscle fibre discharge varying in frequency and amplitude.

There has been no response to phenytoin or carbamazepine. The father of the patient has elevated C.K., but no "myokymia". A male first cousin has identical clinical features to this patient.

This family has an unusual form of muscle disorder which to our knowledge has not been previously described - apparently of autosomal dominant inheritance with variable expressivity.

130.

Low Dose Bromocriptine Compared with Low Dose Sinemet® as Initial Therapy for Parkinson's Disease

J.D. GRIMES, A. KAPOOR, M. DELGADO and P. GRAY (Ottawa, Ontario)

To try and avoid the complications of long-term high dose levodopa therapy, there is interest in using dopamine agonists as initial therapy.

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Twenty "de novo" Parkinson patients were treated with bromocriptine and their initial response rate and adverse effects are compared to 20 low dose Sinemet (maximum 300mg daily) patients. Bromocriptine (1.25mg b.i.d.) was increased by 1.25mg weekly to satisfactory improvement, dose limiting side effects or 30mg daily.

Sixty-five percent of bromocriptine treated patients were improved (mild 4; moderate 8; marked 1) at a mean daily dose of 12.6mg. Three patients responded well at very low daily doses (3.75, 6.25, 7.5mg). Ninety percent of Sinemet treated patients responded (mild 4; moderate 11; marked 3) at a mean daily dose of 292.5mg.

Nausea or vomiting (mean 8.8mg daily) affected 11 bromocriptine treated patients and was the reason for drug withdrawal in 5 patients. Gastric upset (2 patients) and dyskinesias (1 patient) were the only Sinemet related side effects.

Some "de novo" patients are clearly improved with low dose bromocriptine; however, the drop out rate (40%) and incidence of side effects are too high. Low dose Sinemet results in a better grade and rate of initial improvement with few early side effects and is the preferred treatment at present. In future studies, bromocriptine should be combined initially with domperidone (a peripheral dopamine receptor blocker) to avoid early gastric upset, and long-term low dose combination bromocriptine-Sinemet studies are awaited.

131.

The Anatomical Basis of Ideomotor Apraxia

A. KERTESZ (London, Ontario) and J. FERRO

Lesion size and location was studied in 177 stroke patients who had a CT scan and a comprehensive examination for apraxia. An acute (2-6 wks. post onset) and chronic (3-12 months post-onset) group was established. The 20 item test consists of buccofacial, transitive and intransitive limb and bimanual complex movements tested in three conditions of verbal request, imitation and object use. A cut off score of apraxia was determined on 21 age matched controls and patients were placed in three categories of mild, moderate and severe, according to the 1/3 intervals of the total praxis score below the cut off point. CT scans were traced independently from test scores and the lesion outline measured with a digitizer program. Lesion sizes were categorized as percentage of hemispheric volume.

Results indicated a definite correlation between lesion size and severity of apraxia in both acute and chronic groups. In the acute stage, more small lesions were associated with severe apraxia. Anatomical analysis of these crucial lesions for ideomotor apraxia indicated that subcortical frontal, anterior periventricular white matter and, to a lesser extent, left parietal lesions are important. Recovery accounts for 30% of patients in the chronic group who had no apraxia with a large left sided lesion.

132.

Alcoholic Cerebellar Atrophy: Lack of Correlation with Ataxia

P.L. CARLEN, L. FORNAZZARI and D.A. WILKINSON (Toronto, Ontario)

A sample of 51 recently abstinent hospitalized chronic alcoholics had CT scans and the Heath Rail test, a standardized test of gait ataxia. CT scan measurements of supratentorial and infratentorial atrophy included: 3 lateral ventricle measures, the width of the third and fourth ventricles, cerebral and cerebellar sulci, cerebellar pontine and the superior cerebellar cisterns. Alcoholics had larger cerebellar atrophy measurements than age-matched controls. Heath Rail scores correlated significantly with the supratentorial atrophy and very weakly or not at all with the cerebellar atrophy estimations. The supratentorial but not the cerebellar atrophy measurements correlated significantly with the patients' age. The Heath Rail test was most highly correlated ($r=-.75$, $p<.001$) with age. When age was statistically partialled out, there were no correlations between any measures of cerebral or cerebellar atrophy and ataxia. Separating the patients into the following 4 clinical groups (non-impaired, amnesic, impaired but not amnesic, demented) and controlling for age, there was no relationship between the clinical status and any morphological score. In this sample of alcoholics, cerebellar atrophy did not correlate with clinically measured ataxia.

133.

Agenesis of the Corpus Callosum: A Clinical Review

D.D.L. MacGREGOR, H. WHYTE and C.R. FITZ (Toronto, Ontario)

A series of 43 patients diagnosed as having agenesis of the corpus callosum (ACC) by CT scanning seen at the Hospital for Sick Children, Toronto from July 1976 to March 1982 was reviewed. Ages at diagnosis varied from 1 day to 8 years 7 months with 22 of the patients being female. Presenting complaints included seizures (37%), developmental delay and multiple congenital anomalies. There were no consistent findings on general physical examination, however abnormalities of the fingers (syndactyly, polydactyly) and genitalia, as well as various skin lesions were noted. Craniofacial anomalies were common (hypertelorism, skull asymmetry, flat nasal bridge and epicanthal folds). One patient had Apert's syndrome and 4 patients had the features of Aicardi's syndrome. The most common finding on neurological examination was hypotonia. Observed inheritance patterns were autosomal recessive and familial X-linked. Intellectual assessments found only 13% to be normal with 37% functioning in the severe/profound range of retardation. Investigations included metabolic studies, TORCH titres and karyotyping. Five patients had non specific elevations of plasma amino acids and 1 patient had an abnormal karyotype (chromosome 3 deletion). Electroencephalograms were abnormal in 72% with seizure activity being present in 15 recordings. There was a complete agenesis of the corpus callosum in 37 patients; associated CT scan findings included porencephaly, hydrocephalus, cortical atrophy and migration defects. A literature review was carried out and based on this series the authors concluded that: 1) ACC represents only one manifestation of dorsal midline dysgenesis, 2) there is not a characteristic neurogenetic syndrome as a result of agenesis (partial or complete) of this structure but rather that the clinical signs and symptoms noted resulted from coexisting brain anomalies, 3) the findings of ACC will undoubtedly become more common in both symptomatic and asymptomatic patients with the use of CT scanning, 4) the presence of partial ACC does not permit accurate dating of the IU insult nor does it predict outcome, and 5) accurate genetic counselling cannot be given.

134.

Growth of Multicell Spheroids from Experimental and Human Glial Tumors

R. DEL MAESTRO and E. STROUD (London, Ontario)

C_6 astrocytoma and cell lines derived from human glioblastoma multiforme have been established as monolayer cultures. Cells from these lines form spherical multicellular aggregates (spheroids) when maintained in spinner cultures. The C_6 astrocytoma spheroids morphologically resemble lung metastatic nodules from intramuscularly injected C_6 astrocytoma in the rat. Human glioblastoma cell spheroids also resemble the tumour in vivo in that they develop an outer zone containing many cells in division, an intermediate zone which is poorly oxygenated and has decreased nutrition and a central area of necrosis. The spheroids can be broken into single cells and colony formation and biochemical studies performed. Spheroids appear to provide a useful in vitro model in which the effects of oxygenation, nutrition and therapeutic manipulation such as drug and irradiation therapy can be studied.

135.

Variable Phenotypes and New Linkage Data in a Kindred with "Familial Spastic Ataxia"

W.E.M. PRYSE-PHILLIPS, J. O'KEEFE and A. TAVERNOR (St. John's, Newfoundland)

The family of an isolated index case of familial spastic ataxia (hyperreflexic type) was investigated in order to ascertain the pattern of inheritance of the disorder, its penetrance, linkage to HLA and other markers, and the earliest clinical signs allowing diagnosis and prognosis.

From scrutiny of case records, clinical and electrical examinations and positive identification by family members, 45 further affected members of the kinship were detected. Transmission is in an autosomal dominant

manner, probably with complete penetrance, but the latter is unproven since the earliest signs of the disorder occur after age 12 years. There is no linkage to HLA markers in this kinship, but a weak link to Transferrin variant D was established.

Clinically, four phenotypes were exhibited; a pure pyramidal syndrome with both clinical and post-mortem pathological features conforming precisely to Strumpell's familial spastic paraplegia; syndromes of posterior column and pyramidal, and of pyramidal and cerebellar involvement; and a pure cerebellar syndrome. The earliest clinical evidence of the disease was the presence of hyperreflexia. The social impact of the undiagnosed disease, the linkage studies and the variable expression of the disorder will be discussed.

136.

Hippocampal Analysis in Alzheimer's Disease: Chemical and Morphometric Changes

M.J. BALL, H. MERSKEY, M. FISHMAN, R. CAPE, H. FOX, I. FYFE, S. WALLER and E.D. LONDON (London, Ontario)

A prospective clinicopathological study of Alzheimer's Disease (AD) is correlating clinical parameters of dementia with both histomorphometric and neurochemical changes in brains of those patients autopsied. Special attention is paid to differences between topographic regions within the hippocampal formation. Similar measurements are quantified in age-matched mentally normal controls and in patients with other organic dementias. Preliminary data permit comparison of the amount of neurofibrillary tangles (NFT), granulovacuolar degeneration and nerve cell loss from hippocampus with choline acetyltransferase (ChAT) activity from several neocortical regions as well as hippocampal zones. These data suggest: (i) the degree of microscopic and biochemical changes in people with AD is specific for that diagnosis and appreciably worse than in non-Alzheimer dementias; (ii) significant correlations shown between histometric and neurochemical lesions may not exist if only the worst affected cases (i.e., uncomplicated AD) are analysed; (iii) an inverse relationship between hippocampal regions of greatest tangle formation with greatest decline in ChAT activity (and vice versa) may indicate a perikaryal lesion (NFT) is the consequence of a presynaptic biochemical (cholinergic) deficit.

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137.

"Limbic Encephalitis" as Part of Encephalomyeloneuritis Unassociated with Cancer

N.J. WITT, E.S. JOHNSON and G. MONCKTON (Edmonton, Alberta)

Encephalomyeloneuritis is increasingly recognized both in the presence and absence of cancer. However, cases with predominantly limbic involvement are uncommon.

We report the case of a young woman with a fatal four week illness characterized by limbic dysfunction of affect, level of consciousness, and psychomotor seizures. At post mortem, pathologic findings of subacute encephalitis mainly restricted to amygdala, hippocampus, and temporal cortex was found as well as a mature ovarian cystic teratoma. No underlying malignancy was found. No identifiable microbiological agent was detected.

The clinical and pathological features of this case and related cases emphasize that limbic encephalitis is a distinct neurologic syndrome representing an incomplete expression of a broader disease, encephalomyeloneuritis, which may occur with or without cancer.

138.

A Treatable Cause of Coma in the Newborn

I. TEIN, W.J. LOGAN and G. SHERWOOD (Toronto, Ontario)

Transient hyperammonemia of the newborn was first recognized as a treatable cause of neonatal coma in 1978. Since that time there have been over 20 cases reported and it is likely that this syndrome is one of the most common causes of hyperammonemic coma in the newborn. Most cases who have been treated have recovered with little or no neurologic deficit unlike those newborns who have been comatose from other causes. Therefore, it is crucial to recognize this condition at an early stage and to initiate proper therapy. We now report five additional patients with this disorder and emphasize the clinical features which suggest the diagnosis.

These infants were born at 32-39 weeks gestation. Birth asphyxia was not a prominent feature. Each had mild respiratory distress in the first few hours of life progressing within 24 to 72 hours to apnea, respiratory failure and coma. Four of the patients had seizures. On examination the patients were unresponsive and had altered muscle tone, diminished or absent muscle stretch reflexes, unreactive pupils and absent oculocephalic and gag reflexes. Various minor metabolic abnormalities were found in individual patients but each had an elevated serum ammonia level. This ranged from 500 to 1400 μ g/dl (normal in prematures <200 μ g/dl). Peritoneal dialysis for 2 to 5 days reversed the coma and the patients have not had a recurrence even after heavy protein feeds. Subsequent detailed assessment has revealed mild neurological and developmental deficits in these patients who generally are thriving.

Transient hyperammonemia of the newborn of unknown etiology appears to be a relatively common form of neonatal hyperammonemia. The clinical course and neurological signs should lead to early diagnosis and therapy. Aggressive treatment can result in a relatively good outcome.