DISEASES OF THE NERVOUS SYSTEM

Total credits	Theory credits	Practical credits:
13	**2.5**	**10.5**

GENERAL OBJECTIVES

The program *Diseases of the Nervous System* will introduce students to the identification and assessment of the signs and symptoms of the most common and socially significant neurological disorders. In this way students will develop a holistic view of neurological disorders, the basis of this being patients themselves. Students will learn about the basic physiopathological mechanisms, demographics, epidemiology, aetiology pathological anatomy, clinical course, therapeutic management (both medical and surgical), prognosis, the correction of sequelae, the identification of urgency, and the assessment of indications for out-patient care versus hospital admission with respect to the most prevalent neurological disorders.

At the end of the course students must have assimilated the theoretical knowledge and clinical skills required to: identify the main problems caused by neurological disorders, reach a correct diagnosis, choose diagnostic tests with a clear idea of priority and cost/benefit, recommend treatment, and make accurate assessments in the case of neurological emergencies.

SPECIFIC OBJECTIVES

A. At the end of the program students must be able to identify the main problems associated with neurological disorders, specifically:

1. Headaches and other cranial pain
2. Dementia and acute confusional states
3. Disorders of attention, sleep and consciousness. Coma. Epilepsy
4. Language disorders. Apraxia. Agnosia
5. Loss of and double vision
6. Movement disorders
7. Muscular weakness
8. Loss of sensitivity, paraesthesia and dysaesthesia
9. Dizziness and vertigo. Loss of hearing
10. Dysphagia, dysarthria, paralysis and facial neuralgia
11. Gait disorders
12. Sphincter and sexual dysfunction.

B. Students must be familiar with the theoretical bases of the diagnostic methods used with neurological disorders, specifically:

1. The neurological examination
2. Techniques for assessing higher cortical functions
3. Electrophysiological techniques for assessing the central nervous system
4. Techniques for obtaining and studying cerebrospinal fluid. Determination and monitoring of intracranial pressure
5. Neuroimaging techniques
6. Neuropathological techniques and other diagnostic methods

C. Students must be familiar with the diagnosis and medical and surgical treatment of the main neurological disorders, specifically:

1. Headaches
2. Epilepsy
3. Sleep disorders

4. Changes in cerebrospinal fluid circulation, including hydrocephalus and meningitic reactions
5. Tumours of the nervous system
6. Non-viral infections of the nervous system
7. Viral infections of the nervous system
8. Cerebrovascular disorders
9. Head injury
10. Multiple sclerosis and other demyelinizing disorders
11. Hereditary metabolic disorders of the nervous system
12. Neurological disorders secondary to nutritional deficiencies
13. Acquired metabolic disorders of the nervous system
14. Nervous system changes induced by drugs or other chemical agents
15. Parkinson's disease and other movement disorders
16. Alzheimer's disease and other forms of dementia
17. Congenital and developmental disorders of the nervous system
18. Amyotrophic lateral sclerosis and other spinal cord diseases
19. Cerebellar and spinocerebellar diseases
20. Peripheral nerve disorders
21. Cranial nerve disorders
22. Muscle and neuromuscular junction disorders
23. Spinal cord diseases

D. Students must have acquired the following skills:

- Obtain, organize and effectively communicate, both verbally and in writing, the information gathered during the history-taking and physical/neurological examination of patients, regardless of the latter's degree of cognitive comprehension or expression.
- Know how to apply their knowledge of neuroanatomy, neurophysiology and pathological anatomy to interpret correctly the signs and symptoms of the most common neurological disorders.
- Know how to reach a diagnosis through the correct interpretation of information obtained, both clinical and the choice of complementary tests, in order to decide upon subsequent treatment in the case of the most common neurological disorders.
- Be able to identify a neurological emergency and know how to act accordingly.
- Offer guidance in the management of neurological complications and their sequelae.
- Know how to communicate properly with patients and their families.

SYLLABUS

A. IDENTIFYING PROBLEMS

Prior to beginning the course students must be thoroughly familiar with the knowledge gained during the course *General signs and an introduction to clinical pathology* regarding the identification of neurological problems.

1. Headaches and other cranial pain

Be familiar with the cranial structures that are sensitive to pain, and with sudden and chronic, recurring headaches. Identify the types of pain indicative of a potentially serious intracranial lesion and its causes (subarachnoid haemorrhage, intracranial hypertension, meningitis). Be familiar with other neurological syndromes associated with cranial pain (e.g. trigeminal neuralgia). Be familiar with the indications for the use of neuroimaging in managing the patient with headache.

2. Dementia and acute confusional states

Be familiar with the clinical characteristics of acute confusional states, their mechanism and differential diagnosis. Know how to distinguish between confusional states and dementia. Distinguish between isolated memory loss and dementia. Be familiar with the basic characteristics of Alzheimer's disease and other types of dementia. Recognize other amnesic syndromes: Korsakoff's syndrome and transitory total amnesia. Identify behavioural disorders and personality changes in patients with neurological disorders (depression, hypomania, hallucinations, obsessive-compulsive disorder).

3. Disorders of attention, sleep and consciousness. Coma. Epilepsy

Identify the severity of reduced levels of consciousness: obnubilation, stupor and coma. Be familiar with the mechanisms underlying the awake state, sleep and various alterations of consciousness, and identify the cerebral structures affected in patients with altered states of consciousness. Be familiar with the characteristics of patients in coma, locked-in state, persistent vegetative state and in the case of brain death. Identify hypersomnia, its characteristics and the main associated diseases (sleep apnea, narcolepsy and idiopathic hypersomnia). Concept of *parasomnia* and insomnia and identification of treatable causes. Concept of *syncope* and its differential diagnosis with respect to an epileptic seizure. Be familiar with the various causes of syncope. Concept of *epileptic seizure* and recognition of the main types: simple partial seizure, complex partial seizure and generalized seizures. Main causes of epileptic seizures.

4. Language disorders. Apraxia. Agnosia

Know how to assess the basic characteristics of a patient's language. Distinguish between the main types of aphasia (motor, sensory, mixed and others) and know the cerebral location of the lesions responsible. Be familiar with the concepts of *alexia*, *agraphia* and *acalculia*. Distinguish between this aphasia and other disorders of verbal expression. Be familiar with the characteristics of apraxia and its main types (motor, ideational and ideomotor). Be familiar with the main types of agnosia. Be able to locate, through clinical examination, the brain areas in which a lesion produces the different types of apraxia and agnosia.

5. Loss of and double vision

Identify the most common causes of loss of vision. Sudden unilateral blindness (optic neuropathy, optic atrophy, papillary oedema, retinal vasculitis, central retinal artery occlusion). Loss of the central visual field. Concept of *amaurosis fugax* and its differential diagnosis. Be familiar with the causes of gradual loss of vision. Learn to examine a patient with double vision and identify the main causes (paralysis of the VI cranial nerve, paralysis of the III cranial nerve, brain stem lesion, muscular defect). Identify pupil changes (Horner's syndrome, Adie's pupil, Argyll-Robertson pupil) and the possible causes. Identify changes in eyelid motility (unilateral or bilateral palpebral ptosis, blepharospasm). Identify the most common signs and symptoms of visual changes due to cerebral cortex lesions.

6. Movement disorders

Be familiar with the characteristics of Parkinson's disease. Identify the most common movement disorders: tremor, tics, chorea, dystonia, myoclonus and stereotypic movements. Distinguish between idiopathic and secondary movement disorders. Identify the treatable causes of movement disorders.

7. Muscular weakness

Be familiar with the characteristic of muscular weakness (or paralysis) due to lesions of the upper and lower motor neurons and the pyramidal pathway. Concept of *motor unit*. Distinguish between muscular weakness/paralysis and pseudoparalysis. Learn the differential diagnosis of forms of muscular paralysis. Be able to recognize monoplegia, hemiplegia, paraplegia, tetraplegia and generalized muscular weakness, and be able to localize the lesions responsible. Recognize muscular atrophy with or without associated weakness, fasciculations and myotonia and its clinical significance. Understand the role of complementary tests in assessing a patient with muscular weakness.

8. Loss of sensitivity, paraesthesia and dysaesthesia

Be familiar with sensory changes in the extremities and torso. Recognize the clinical features indicative of mononeuropathy, radiculopathy and polyneuropathy. Be familiar with the defined patterns of sensory change: neuropathy due to leprosy or porphyry, syringomyelia and other spinal cord lesions, brain stem and supratentorial lesions. Neurological causes of pain and arm and leg paraesthesia.

9. Dizziness and vertigo. Loss of hearing

Be familiar with the concept and different causes of dizziness and vertigo: benign positional vertigo, vestibular neuronitis, otosclerosis, Méniere's syndrome. Distinguish between benign forms of dizziness and those associated with potentially serious causes, such as cerebellar angle tumours, cardiac arrhythmias, drug-induced toxicity or that caused by head injury. Recognize psychogenic and other causes of dizziness. Identify the various types of hearing

loss and recognize the neurological causes. Complementary tests in patients with altered hearing or dizziness and vertigo.

10. Dysphagia, dysarthria, paralysis and facial neuralgia

Be able to identify dysarthria and make its differential diagnosis. Distinguish between dysarthria and aphasia. Identify dysphonia and its causes. Other speech disorders: stammering, palilalia. Identify hypoglossal paralysis and the characteristics of jugular foramen syndrome. Recognize the clinical characteristics of neuralgic pain and trigeminal neuralgia. Identify the possible causes of the process and know how to diagnose it. Recognize the characteristics of facial paralysis (*à frigore* or Bell's palsy) and distinguish it from central facial paralysis. Make a differential diagnosis of the various causes of cranial nerve changes.

11. Gait disorders

Identify the main gait disorders and distinguish between normal and pathological gait. Know the main causes of gait pathology (paresic and spastic gait, myopathic gait, ataxic gait and *marche a petit pas*) in hemiplegia, paraparesia, Parkinson's disease, torsion dystonia, muscular dystrophy, and in frontal lobe and lower motor neuron lesions. Concept of *ataxia*. Recognize disorders of gait and coordination with cerebellar lesions.

12. Sphincter and sexual dysfunction

Be familiar with the normal mechanisms of urinary bladder function and sphincter control. Recognize the clinical signs of bladder changes: urgent micturition, incontinence, detrusor failure. Recognize the neurological changes responsible for the different signs. Identify erectile, ejaculatory and orgasm dysfunctions and identify the neurological and peripheral causes.

B. THEORETICAL BASES OF THE DIAGNOSTIC METHODS USED WITH DISEASES OF THE NERVOUS SYSTEM

1. The neurological examination

Examination of upper cortical functions. Examination of level of awareness and the comatose patient. Examination of the cranial nerves. Examination of strength, tone and coordination. Osteotendinous reflexes. Plantar reflex. Examination of sensitivity. Examination of posture, gait and righting reflexes.

2. Techniques for assessing upper cortical functions

Assessing level of awareness. Assessing attention, language, orientation, memory, praxis and agnosia. Upper cognitive functions and calculation. Mini-mental exam in the assessment of dementia. Practical neuropsychological scales.

3. Electrophysiological techniques for assessing the central nervous system

Electroencephalography. Videoelectroencephalography. Visual and auditory brain stem evoked potentials, somatosensory potentials. Cranial and spinal magnetic stimulation techniques. Polysomnography. Multiple latency test of sleep. Electrophysiological techniques for assessing the peripheral and muscular nervous system. Determining motor and sensory nerve conduction. Electromyography. Studying the functioning of the neuromuscular junction.

4. Techniques for obtaining and studying cerebrospinal fluid. Determination and monitoring of intracranial pressure

Lumbar puncture: technique, collecting cerebrospinal fluid (CSF) and analysis of CSF. Indications and contraindications. Techniques for determining and continuous monitoring of intracranial pressure. Infusion test.

5. Neuroimaging techniques

Simple cranial and spinal x-ray. Cranial and spinal computed axial tomography and nuclear magnetic resonance: indications for the two techniques. Advantages and disadvantages of the two techniques compared with other diagnostic methods. Contraindications. Positron emission tomography and SPECT. Theoretical bases of the two techniques. Diagnostic indications and contraindications. Cerebral angiography. Resonance. Angiography. Carotid ultrasound/Doppler. Transcranial Doppler. Theoretical basis. Method and diagnostic utility of these tests. Limitations and contraindications.

6. Neuropathological techniques and other diagnostic methods

Neurogenetics, determination of antineural antibodies, neuropathological techniques (muscle biopsy, nerve biopsy, cerebral biopsy).

C. DIAGNOSIS AND TREATMENT OF THE MAIN DISEASES OF THE NERVOUS SYSTEM

1. Headaches and other craniofacial pain

Headaches. Definition. Classification. Chronic recurrent headaches: migraine, cluster headache, tension headaches. Other chronic headaches. Physiopathology. Types of headache: headache due to intracranial lesions: tumours, aneurysms, meningitic irritation). Headaches associated with systemic processes (fever, arterial hypertension). Headaches of extracranial origin: ocular aetiology (glaucoma), sinusitis and cervical skeletomuscular changes. Migraines. Cluster headaches. Tension headaches. Psychogenic headaches. Post-traumatic headaches. Diagnostic strategy with the cranial pain patient.

2. Epilepsy

Definition. Prevalence. Classification of epileptic seizures. Partial and generalized seizures. Differential diagnosis with respect to syncope, cerebrovascular accident and migraine. Most common epileptic symptoms. Clinical data to be gathered and procedure required when faced with an epileptic seizure. Epileptic status. Treatment of epilepsy: most common antiepileptic drugs. Epilepsy and pregnancy. Epilepsy and traffic accidents. Withdrawal of antiepileptic medication. Refractory epilepsy. Definition and procedure to be followed. Surgical treatment of epilepsy. Indications, diagnostic assessment and outcomes.

3. Sleep disorders

Characteristics of normal sleep. Sleep-wake cycles and factors that control them. Prevalence of the most common sleep disorders. Respiratory changes during sleep. Snoring. Obstructive sleep apneas: clinical and polysomnographic characteristics. Repercussions for health and treatment. Narcolepsy: clinical characteristics, diagnosis and treatment. Most common forms of parasomnia: somnambulism, night terrors, nocturnal enuresis, nocturnal paroxysmal dystonia, behavioural disorders associated with REM sleep, nocturnal epileptic seizures, rhythmic movements during sleep. Insomnia. Definition and characteristics of the different types. Treatment.

4. Hydrocephalus and other circulatory fluid changes

Physiology of cerebrospinal fluid. Endocranial hypertension: mechanisms of production, assessment and treatment methods. Hypertensive hydrocephalus. Clinical features. Clinical syndromes: *a*) congenital hydrocephalus; *b*) occult hydrocephalus; *c*) normotensive hydrocephalus. Benign endocranial hypertension (cerebral pseudotumour). Other non-tumour causes of endocranial hypertension. Hypotension. Post-lumbar puncture headaches.

5. Tumours of the nervous system

Intracranial tumours. Epidemiology. Supratentorial tumours. Infratentorial and sellar tumours. Diagnosis and treatment. Neurosurgical techniques.

6. Non-viral infections of the nervous system

Acute meningitis: epidemiology, clinical features, interpretation, CSF findings, diagnosis, treatment. Chronic meningitis: epidemiology, clinical features of tuberculous meningitis, differential diagnosis, treatment. Brain abscess: epidemiology, clinical features, treatment.

7. Viral and prion infections of the nervous system

Acute encephalitis: concept, epidemiology, clinical features of herpes encephalitis, diagnostic methods, treatment. Encephalitis and slow viruses: concept, classification. Progressive multifocal leukoencephalopathy: epidemiology, clinical features, diagnosis. AIDS dementia complex: clinical features, neuropathology, treatment. Prion diseases: concept of *prion*, classification and clinical features. Creutzfeldt-Jakob disease, diagnostic criteria.

8. Cerebrovascular diseases

Disease definition and prevalence. Symptoms produced by occlusion of the different cerebral arteries. Occlusion of the supra-aortic trunk, common carotid, internal carotid bifurcation, middle cerebral (trunk, penetrating arteries, cortical branches), anterior cerebral, posterior cerebral (penetrating arteries, cortical branches), basilar trunk and penetrating arteries, vertebral arteries. Differential diagnosis between different cerebrovascular accidents according to the type of clinical presentation: thrombosis embolism, haemorrhage. Transitory ischemic attacks (TIA), reversible ischemic neurological deficit (RIND), partially established ictus. Complementary tests: CAT, arteriography, magnetic

resonance, transcranial Doppler. Prognosis following cerebrovascular accident. Ischemic cerebrovascular accidents. Prevalence of the different types. Cerebral embolism. Mechanisms. Embolism of cardiac origin. Causes and risk of embolism. Risk of recurrence. Risk of haemorrhagic infarct. Intra-arterial embolism. Causes of recurrence. Symptomatic and preventive treatment. Control of arterial hypertension. Anticoagulants. Anti-platelet-aggregating drugs. Arterial surgery (endarteriectomy, temporal/middle cerebral artery bypass). Indications and outcomes of each medical and surgical treatment. Interventionist angioplasty. Haemorrhagic cerebrovascular accidents. Prevalence. Types of haemorrhage. Aetiology and physiopathology of symptoms. Differential diagnosis. Hypertensive haemorrhages: putamen, thalamic, cerebral and protuberance; clinical characteristics. Lobar haemorrhages. Aetiology. Clinical characteristics. Subarachnoid haemorrhages. Aetiology. Clinical presentation and treatment. Vascular malformations.

9. Head injury

Epidemiology and classification. Reception and assessment of head injury. Multiple head injury. Clinical and neurological examination and neuroimaging. Concussion and contusion. Endocranial hypertension. Intracranial haemorrhages. Monitoring. Medical and surgical treatment. Immediate and late-onset post-traumatic sequelae. Treatment. Neurosurgical indications and techniques.

10. Multiple sclerosis and other demyelinizing diseases

Multiple sclerosis: definition. Symptoms: motor, sensory and sphincter disorders. Paroxysmal phenomena. Visual symptoms. Cognitive and emotional disorders. Signs: motor disorders. Cerebellar and brain stem disorders. Clinical forms of presentation. Patterns of development: recurrent-remittent, acute, chronic-progressive. Diagnostic techniques: neurophysiological, CSF and neuroradiological tests. Diagnostic criteria: clinically certain, probable or possible. Differential diagnosis. Epidemiology. Pathogeny. Neuropathological characteristic. Prognosis. Symptomatic treatment. Immunopharmacological treatment. Sub-acute disseminated encephalomyelopathy. Definition. Clinical features. Development and prognosis. Laboratory analyses. Pathogeny. Treatment.

11. Hereditary metabolic diseases of the nervous system

Neurological assessment of the newborn with metabolic disease. Frequency of neonatal metabolic diseases. Amino acid disorders. Galactosemia. Hyperglycemia. Hyperammonemia. Maple syrup disease. Diagnosis. Hereditary metabolic diseases in childhood. Tay-Sachs disease, Gaucher's disease, Niemann-Pick disease, GM1 gangliosidosis, Krabbe's leukodystrophy, Pelizaeus-Merzbacher leukodystrophy, Alexander's disease, Alpers' disease. Others. Metabolic diseases in adolescence: aminoaciduria, metachromatic leukodystrophy, neuroaxonal dystrophy, mucopolysaccharidosis, mucolipidosis, fucosidosis, mannosidosis, Cockayne's syndrome.

12. Diseases of the nervous system secondary to nutritional deficiencies

General considerations. Wernicke's/Korsakoff's syndrome. Ocular changes, ataxia, altered awareness. Amnesic syndrome. Clinical course. Neuropathlogy and clinical correction. Nutritional polyneuropathy (beri-beri). Nutritional optic neuropathy. Pellagra. Strachan's syndrome. Neurological manifestations of vitamin B_{12} deficiency. Other disorders of probable nutritional origin: alcoholic cerebellar degeneration, central pontine myelinolysis, Marchiafava-Bignami disease.

13. Acquired metabolic diseases of the nervous system

Classification. Diseases that present with an episodic syndrome of confusion, stupor or coma, sodium and potassium disorders. Metabolic diseases that present in the form of progressive movement disorders. Metabolic diseases that take the form of ataxia. Metabolic diseases that lead to psychosis and dementia. Encephalopathy: hepatic, hypoglucemic and hyperglucemic, uremica, hypercapnic. Reye's syndrome.

14. Nervous system changes induced by drugs and other chemical agents

Neurological complications of alcoholism. Acute ethanol poisoning. Ethanol withdrawal syndrome: *delirium tremens*); convulsive seizures. Treatment of chronic alcoholism. Other forms of poisoning: aluminium, arsenic, barium, bismuth, lead, mercury, thallium, organic solvents and pesticides: signs and symptoms, prevention and treatment. Neurological complications of drug addiction.

15. Parkinson's disease and other movement disorders

Parkinson's disease. Epidemiology. Aetiology. pathological anatomy and physiopathology. Clinical features. Course and prognosis. Diagnosis and differential diagnosis. Pharmacological treatment: anticholinergics, levodopa, dopamine agonists. Surgical treatment. Other therapeutic measures. Parkinson's disease secondary to use of neuroleptic drugs and after encephalitis or vascular disease. Parkinson-plus syndromes associated with other neurological diseases: progressive supranuclear paralysis, striatonigral degeneration, multisystem atrophy.

Sydenham's chorea. Aetiology and pathological anatomy. Signs and symptoms. Laboratory data. Complications. Diagnosis. Course. Prognosis and treatment. Huntington's chorea. Neuropathology. Prevalence and hereditary factors. Clinical features: chorea, dementia and other neurological manifestations. Differential diagnosis. Laboratory analysis. Treatment. Other choreas. Hemiballism. Myoclonus. Tics and Tourette's syndrome. Torsion dystonia: prevalence. Pathological anatomy and pathogenesis. Signs and symptoms. Differential diagnosis. Treatment. Spasmodic torticollis. Blepharospasm. Writer's cramp. Tardive dyskinesia and other iatrogenic movement disorders. Wilson's disease.

16. Alzheimer's disease and other dementias

Alzheimer's disease: History. Incidence and prevalence. Clinical features. Stages of development. Diagnostic criteria: possible, probable or definite Alzheimer's disease. Differential diagnosis. Neuropathological changes. Neurochemical alterations. Aetiology. Treatment and management. Frontotemporal dementias: Pick's disease: clinical manifestations, diagnostic techniques, pathology, epidemiology, clinical course, treatment and management. Focal cortical atrophy (frontal lobe degeneration, primary progressive aphasia, posterior cortical atrophy). Vascular dementia. Single cerebral lesions: secondary mental changes. Multi-infarct dementia: clinical manifestations, diagnostic techniques, pathology, pathogeny, aetiology, epidemiology, course and prognosis, treatment and management. Subcortical arteriosclerotic encephalopathy (Binswanger's disease): clinical manifestations, diagnostic techniques, pathology, pathogeny, aetiology, epidemiology, course and prognosis, treatment and management. Vasculitis and microangiopathy: types and clinical manifestations.

17. Congenital and developmental diseases of the nervous system

Neurological changes associated with craniospinal anomalies: Craniostenosis. Macrocephalus. Microcephalus. Causes. Clinical manifestations and treatment. Rachischisis: Dandy-Walker syndrome. Arnold-Chiari malformation. Platybasia and cervical spinal anomalies. Chromosomal anomalies. Down syndrome (mongolism). Facomatosis. Tuberous sclerosis. Neurofibromatosis. Neurocutaneous angiomatosis. Developmental anomalies limited to the nervous system. Moebius syndrome. Congenital motor anomalies: cerebral palsy: spastic diplegia, childhood hemiplegia, congenital extrapyramidal disorders (double athetosis, *kernicterus*). Other motor anomalies. Pre- and perinatal infections: rubella, toxoplasmosis, cytomegalovirus, congenital neurosyphilis, others. Childhood epilepsy and neonatal seizures, febrile seizures, childhood spasms, petit mal. Mental retardation: clinical characteristics. Causes.

18. Amyotrophic lateral sclerosis and other spinal cord diseases

Diseases that affect the upper motor neuron: familial spastic paraplegia. Clinical features. Pathology. Pathogeny and aetiology. Course and prognosis. Treatment and management. Lathyrism: clinical features. Pathogeny and aetiology. Course and prognosis. Treatment. Diseases that affect the lower motor neuron: *a*) Hereditary diseases. Spinal muscular atrophy (SMA). SMA type I (acute childhood Werdnig-Hoffmann disease). SMA type II (late childhood or juvenile onset). SMA type III (adult onset): types of presentation: bulbospinal muscular atrophy, distal spinal muscular atrophy, scapuloperoneal spinal muscular atrophy. History. Genetics. Clinical features. Laboratory tests. Pathology. Pathogeny and aetiology. Epidemiology. Course and prognosis. *b*) Acquired diseases. Focal forms: benign focal amyotrophy. Secondary spinal muscular atrophy: multiple myeloma, lead poisoning, hexosaminidase deficiency, Creutzfeldt-Jakob disease, lymphomas, post-irradiation. Post-polio syndrome: diagnostic criteria. Epidemiology. Course and prognosis. Treatment. Diseases that affect the upper and lower motor neuron: Amyotrophic lateral sclerosis (ALS): History. Clinical features. Laboratory tests. Neurochemical and neuroimmunological changes. Pathology. Pathogeny and aetiology. Animal models. Epidemiology. Course and prognosis. Treatment and management. Associated disorders. Syringomyelia: clinical features. Laboratory tests. Pathology, pathogeny and aetiology. Course and prognosis. Treatment and management. Associated disorders. Sub-acute combined degeneration: clinical features. Laboratory studies. Pathology. Pathogeny and aetiology. Course and prognosis. Treatment. Myelopathy due to cervical spondyloarthrosis. Spinal disc disorders. Physiopathology. Clinical manifestations. Treatment. Spinal cord tumours. Intramedullary and extramedullar tumours. Frequency. Clinical manifestations and differential diagnosis. Medical and surgical treatment. Spinal arachnoiditis. Epidural abscess. Radiation-induced myelopathy.

19. Cerebellar and spinocerebellar diseases

Hereditary congenital ataxias. Paraneoplastic cerebellar degeneration. Hereditary ataxias with metabolic defects: intermittent ataxias, progressive ataxias. Ataxia secondary to endocrine disorders. Ataxia telangiectasia. Cerebellar syndromes due to vitamin E deficiency, alcoholism, drugs, solvents and other toxins. Degenerative cerebellar diseases: Friedreich's ataxia: clinical features. Laboratory tests. Differential diagnosis. Genetic aspects. Pathology. Pathogeny and aetiology. Course and prognosis. Treatment and management. Late-onset hereditary ataxia (olivopontocerebellar atrophy): clinical and pathological heterogeneity. Autosomal dominant cerebellar ataxia, type 1:

clinical features. Machado-Joseph disease. Laboratory tests. Genetic aspects. Pathology. Pathogeny and aetiology. Course and prognosis. Treatment. Other hereditary ataxias.

20. Peripheral nerve diseases

Review of anatomy. Utility of electromyography and nerve biopsy. Mononeuropathy: definition, epidemiology, clinical features of the most common forms of mononeuropathy, treatment. Multineuropathy: concept, epidemiology, most common causes. Polyneuritis and multineuritis: *a*) Acquired forms. Acute idiopathic polyneuritis (Guillain-Barré syndrome). Differential diagnosis, treatment. Non-hereditary chronic inflammatory polyneuropathy: clinical syndrome, classification. Neuropathy due to blocked conduction. Metabolic neuropathy. Neuropathy linked to collagen disorders. Vasculitis. Neuropathy due to drugs and industrial toxins. Neuropathy linked to neoplasias and dysproteinemia. Sensory neuron disorders (Denny-Brown syndrome). Infectious neuropathy. Leprosy. Neuroborreliosis. HIV. *b*) Hereditary polyneuropathy. Lipid metabolism disorders. Amyloidosis. Sensorimotor hereditary polyneuropathy, types I and II. Pressure neuropathy.

21. Cranial nerve disorders

Trigeminal neuralgia. Differential diagnosis and treatment. Signs and symptoms of facial nerve lesions. Common facial paralysis (à f*rigore/Bell's palsy*): aetiology, differential diagnosis and treatment. Glossopharyngeal neuralgia. Hypoglossal neuralgia. Jugular foramen syndrome. Oculomotor syndromes of the brain stem: internuclear ophthalmoplegia, Parinaud's syndrome. Vertigo and cranial nerve VIII syndromes. Other brain stem syndromes: diencephalic, thalamic, of the foramen magnum, syringobulbia and ischemic syndromes. Cavernous sinus syndrome.

22. Muscle and neuromuscular junction disorders

Signs: motor weakness, fatigue, fasciculation, cramp, myotonia. Syndromes: oculomotor paralysis, bilateral facial paralysis. Bulbar paralysis, proximal muscle paralysis. Paraclinical tests: muscle enzymes, electromyogram, muscle biopsy. Neuromuscular junction disorders; myasthenia gravis: epidemiology, clinical features, types of presentation, diagnostic criteria, treatment. Lambert-Eaton syndrome: epidemiology, clinical features, diagnosis, treatment. Physiopathology of neuromuscular junction disorders. Myopathy: concept of inflammatory myopathy, classification, diagnostic criteria, treatment. Muscular dystrophy: classification, diagnostic criteria, myopathy associated with altered dystrophin levels. Myotonic dystrophy. Congenital myopathy: classification, diagnostic criteria. Mitochondrial myopathy: mitochondrial myopathy *vs*. mitochondrial cytopathy, classification, most common clinical presentations, diagnostic criteria.

TEACHING PLAN

THEORY CLASSES

1. General principles and concepts of anatomical localization (Dr. Tolosa)
2. Headaches (Dr. Tolosa)
3. Headaches II (Dr. Tolosa)
4. Coma and sleep disorders (Dr. Santamaría)
5. Endocranial hypertension (Dr. Ferrer)
6. Hydrocephalus (Dr. Ferrer)
7. Epilepsy I (Dr. Santamaría)
8. Epilepsy II (Dr. Santamaría)
9. Multiple sclerosis and other demyelinizing disease (Dr. Graus)
10. Cerebrovascular pathology I (Dr. Santamaría)
11. Cerebrovascular pathology II (Dr. Santamaría)
12. Vascular malformations and subarachnoid haemorrhage (Dr. Ferrer)
13. Infections I (Dr. Graus)
14. Infections II (Dr. Graus)
15. Parkinson's disease (Dr. Tolosa)
16. Huntington's disease and other movement disorders (Dr. Tolosa)

17. Alzheimer's disease (Dr. Blesa)
18. Frontotemporal and other dementias (Dr. Blesa)
19. Amyotrophic lateral sclerosis. Ataxias (Dr. Graus)
20. Diseases of the peripheral nervous system (Dr. Valls)
21. Motor endplate and muscle diseases (Dr. Valls)
22. Neurosurgical spinal cord disorders (Dr. Ferrer)
23. Nervous system neoplasias. Medical aspects (Dr. Graus)
24. Nervous system neoplasias. Surgical aspects (Dr. Ferrer)
25. Head injury (Dr. Ferrer)

SCHEDULED CLINICAL TEACHING

A. Seminars run simultaneously for all students, alternating with theory classes

1. Clinical pharmacology of drugs used in movement disorders
2. Cerebrovascular disorders: neurosurgical aspects
3. Infectious diseases of the nervous system: case studies
4. Nervous system tumours: pathological anatomy and management
5. Head injury
6. Spinal cord disorders
7. Diagnostic functional tests of the peripheral nervous system
8. Diagnostic functional tests of the central nervous system
9. Nuclear medicine in neurological diagnosis
10. Radiotherapy and radiosurgery in nervous system diseases
11. Neurorehabilitation
12. Neuroimaging
13. Pathological anatomy of muscular and peripheral nerve diseases
14. Pathological anatomy of demyelinizing diseases
15. Pathological anatomy of degenerative diseases of the nervous system

B. Seminars run during clinical placements, in the corresponding service

1. Cerebrovascular pathology. Case studies I
2. Cerebrovascular pathology. Case studies II.
3. Epilepsy: case studies
4. Movement disorders: case studies
5. Diseases of the peripheral nervous system: case studies
6. Memory disorders and dementia: case studies
7. Cranial nerve pathology
8. Neuromuscular pathology: case studies
9. Head injury
10. Pharmacological bases of migraine treatment. Undesired drug effects.
11. Evidence-based medicine (ictus) (Dr. A. Granados).

ROWLAND L. (Ed.) *Merritt's Textbook of Neurology*. Lea & Febiger, 1995.

LEARNING REQUIREMENTS

Students must have basic prior knowledge of neuroanatomy and neurophysiology, as well as of neurological signs, basic pathology and the biological bases of surgery. At all events, these aspects will be emphasized during clinical placements and their importance with respect to the patient-problem relationship will be addressed.