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 dyasaesthesia
   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 parsonomnia 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 neuritis, otosclerosis, Ménière’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

3. Electrophysiological techniques for assessing the central nervous system

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
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

2. Epilepsy

3. Sleep disorders

4. Hydrocephalus and other circulatory fluid changes

5. Tumours of the nervous system

6. Non-viral infections of the nervous system

7. Viral and prion infections of the nervous system

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

9. Head injury

10. Multiple sclerosis and other demyelinizing diseases

11. Hereditary metabolic diseases of the nervous system

12. Diseases of the nervous system secondary to nutritional deficiencies

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, hypoglycemic and hyperglycemic, uremic, hypercapnic. Reye’s syndrome.

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

15. Parkinson’s disease and other movement disorders

16. Alzheimer's disease and other dementias

17. Congenital and developmental diseases of the nervous system

18. Amyotrophic lateral sclerosis and other spinal cord diseases

19. Cerebellar and spinocerebellar diseases
20. Peripheral nerve diseases

21. Cranial nerve disorders

22. Muscle and neuromuscular junction disorders

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 demyelinating 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
11. Evidence-based medicine (ictus) (Dr. A. Granados).


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.