



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Anatomia 2

2627-2-H4103D160-H4103D16001

Aims

The objectives of the module are aimed at providing the competences for the knowledge of the systematic and functional anatomy of the central and peripheral nervous system and sensory organs, integrating the structural aspect with anatomo-clinical correlations.

Contents

The course aims to teach the gross anatomy of the various parts composing the central and peripheral nervous systems and the sensory organs, with particular reference to morphological and functional aspects, as well as anatomo-clinical correlations.

Detailed program

NERVOUS SYSTEM

Development of the nervous system: neurulation, neural crest formation and differentiation, primary and secondary brain vesicles and their development, formation of midline structures, development of the spinal cord. Neural tube defects and major disorder of brain development.

Introduction to the study of the nervous system.

General organization: central and peripheral nervous system.

CENTRAL NERVOUS SYSTEM

- External and internal morphological features of spinal cord, brainstem, cerebellum, diencephalon and telencephalon. Relationships among the different parts of the central nervous system.

- Spinal cord: laminar and columnar organization of the gray matter, organization of the white matter, arrangement and position of the most important ascending and descending tracts. Reflex arc. Pain control: the gating theory. Meningeal spaces and their content. Cerebrospinal fluid circulation in the spinal cord. Lumbar cistern.

- Brainstem: subdivision into medulla, pons and midbrain and their organization; position of cranial nerves nuclei and of other major nuclei ; reticular formation, general arrangement and its functional significance ; mesencephalic tectum with superior and inferior colliculi. Ascending and descending pathways. 4th ventricle and cerebral aqueduct.

- Cerebellum: cerebellar vermis and hemispheres. Cerebellar lobes. Correlation between anatomical and functional areas. Organization of gray and white matter, structure of the cerebellar cortex, intracerebellar nuclei. Cerebellar afferent and efferent tracts. Cerebellar peduncles. Relation to the 4th ventricle. Functions of the cerebellum

- Diencephalon: basic division into thalamus, hypothalamus, subthalamus, epithalamus. Thalamus: nuclear groups, main thalamic nuclei and their major connections, white matter. Hypothalamus: classification of nuclei and their main connections; relationship to pituitary gland. Subthalamus: subthalamic nucleus, fields of Forel. Epithalamus: habenular nuclei, pineal gland. Functional significance of the different parts of diencephalon. Relation to the 3rd ventricle

- Telencephalon: general appearance of the cerebral hemispheres (lateral, medial and inferior surface), subdivision in lobes and gyri, main sulci. Organization of the white matter in association, commissural and projecting fibers. Internal capsule, location and detailed arrangement of its fibers. Corpus callosum, its division and relationship. Organization of the cerebral cortex, particularly the neocortex with its different cell types. Cortical areas and localization of functions. Basal ganglia (striatum and globus pallidus), their location, organization and relationships to lateral ventricles and internal capsule; functional correlation with subthalamic nucleus and substantia nigra in movement control.

- The limbic system: cortical and subcortical components. Cortical structures: limbic lobe and hippocampal formation; subcortical structures: amygdala, septal nuclei, ventral striatum, nucleus accumbens, various thalamic and hypothalamic nuclei. Structure of the trilaminar cortex of hippocampus and dentate gyrus. Connecting pathways of the limbic system, afferent and efferent fibers.

- Blood supply of the brain and spinal cord. Arteries of the brain: internal carotid artery, vertebral and basilar arteries, their course, relations and terminal branches. Detailed knowledge of circle of Willis. Arteries of the spinal cord: posterior and anterior spinal arteries. Regional arteries of the brain and segmental spinal arteries. Veins of the brain: deep and superficial veins; detailed knowledge of dural venous sinuses. Veins of the spinal cord.

- Ventricular system and cerebrospinal fluid. Ventricles and canals in the brain and spinal cord which form the ventricular system: lateral ventricles, third ventricle, cerebral aqueduct (of Sylvius), fourth ventricle, central canal of the spinal cord with its terminal ventricle. Location, shape and relationships with cerebral and spinal structures, communication with subarachnoid space. Choroid plexuses. Circumventricular organs. Cerebrospinal fluid: formation, circulation, absorption, composition and function. Blood-brain and blood-cerebrospinal fluid barriers. Subarachnoid space and position of the major subarachnoid cisterns.

- Coverings of the brain and spinal cord (meninges). Meninges of the brain. Dura mater, its layers and septa: falx cerebri, falx cerebelli, tentorium cerebelli forming tentorial notch, diaphragm sellae. Subdivision in supra and infratentorial compartments. Dural venous sinuses. Arachnoid mater. Formation of subarachnoid space. Pia mater. Meninges of the spinal cord, extradural space.

PERIPHERAL NERVOUS SYSTEM

- Origin and composition of the nerve roots. Relations with bone structures, meninges and medullary spaces.

Constitution and relationships of the nervous plexuses. Origin, composition, peripheral distribution and relationships of the spinal nerves.

- Localization of the nuclear complexes of the cranial nerves. Origin and composition of the cranial nerves. Course of the cranial nerves, with particular reference to the exit holes from the cranial cavity and to their relationships.

AUTONOMIC NERVOUS SYSTEM

General organization of the autonomic nervous system and its main division in two parts, sympathetic and parasympathetic. Afferent and efferent nerve fibers. Preganglionic and postganglionic fibers. Neurotransmitters involved. Autonomic ganglia. Large autonomic plexuses.

Anatomical, physiological and pharmacological differences between sympathetic and parasympathetic divisions. Sympathetic division: sympathetic trunks and ganglia, rami communicantes. Parasympathetic division: cranial and sacral components, cranial nerves involved. Functions of the autonomic nervous system.

The enteric nervous system

Some important autonomic innervation: eye, salivary and lacrimal glands, urinary bladder, gastrointestinal tract, heart, medulla of suprarenal gland, genital organs, skin.

THE MAJOR NEURAL PATHWAYS

Spinal and medial lemniscal tracts ; spinocerebellar tracts; lateral and medial descending motor systems; cerebellar and basal ganglia motor control; olfactory, gustatory, visual, auditory and vestibular systems. Parallel basal ganglia circuits. Diffuse projection systems. Medial longitudinal fasciculus.

Description of the organization, course and relations of each of these pathways, their origin, termination and synaptic stations.

CLINICAL NEUROANATOMY

Central nervous system

Anatomic basis of some common central nervous system diseases: ischemic brain injuries, cerebral hemorrhages, cerebral malformations, hydrocephalus, space-occupying lesions, cerebral herniations.

Consciousness and its disorders.

Mirror neurons.

Peripheral nervous system

Examples of clinical syndromes related to lesions of the roots, nerve plexuses and spinal nerves and their anatomic-functional basis.

Examples of clinical syndromes related to lesions of the nuclei and fibers of the cranial nerves and their anatomic-functional basis.

SPECIAL SENSES

***The eye. ***

Coats of the eyeball. Eyelids. Lacrimal apparatus. Blood supply and innervation of the eye.

***The ear. ***

External ear. Middle ear (tympanic cavity). Internal ear (Labyrinth). Blood supply and innervation of the ear.

Prerequisites

Knowledge of the subjects covered in the second semester of the first year

Teaching form

Frontal lessons and seminars.

Interactive lessons: problem-solving laboratories, clinical case simulations, presentation of radiological images of the nervous system for identification of structures.

In addition, the 'Anatomage' anatomical table—a 3D digital visualization system for virtual dissections—is available to students in the Building U8 library*. Access is managed via a booking system and supervised by tutors

Textbook and teaching resource

Nervous system: textbooks for further reading

- Vercelli A. Boido M. Neuroanatomia funzionale - Idelson-Gnocchi
- L. Heimer. The Human Brain and Spinal Cord –Functional neuroanatomy and dissection guide. Springer- Verlag
- Dockery P, Gruener G, Mtui E - Fitzgerald. Neuroanatomia con riferimenti funzionali e clinici- Edra
- Barr: Il Sistema Nervoso dell'Uomo. Basi di Neuroanatomia di Kiernan JA e Rajakumar N. Edises
- Istituzioni di Anatomia dell'Uomo - Sistema nervoso centrale (a cura di E. Gaudio) - Piccin
- Istituzioni di Anatomia dell'Uomo - Sistema nervoso periferico ed organi di senso (a cura di R. De Caro) - Piccin
- Haines DE. Neuroanatomia nel contesto clinico. Strutture, sezioni, sistemi e sindromi. Atlante. Edi-Ermes
- Blumenfeld H. Neuroanatomia attraverso casi clinici – (a cura di E. Pegoraro, C. Briani, G. Solaru) - Piccin

Always refer to the latest edition for all textbooks

Semester

First semester of the second year

Assessment method

Final oral examination.

See General Syllabus of "Human Anatomy and Histology" for details

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Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION | GENDER EQUALITY | REDUCED INEQUALITIES
