Degree Course in Medicine and Surgery

Class: Human Anatomy I
SSD Class: BIO/16
CFU Number: 7
Professor: Ciro De Luca
Email : ciro.deluca@unicamillus.org
office hours by appointment: Wednesday 01:00-02:00 pm

PREREQUISITES

There are no mandatory prerequisites to be respected. However, it is recommended to have basic knowledge of cell biology, histology, and cytology to optimize the achievement of learning objectives.

LEARNING OBJECTIVES

The Human Anatomy I class aims to provide the morpho-functional knowledge of the human body, required by the Medical Doctors regardless of their specialties to understand the physiology and pathology of organs and their systemic repercussions. The regional approach with clinical imaging support (conventional radiology and magnetic resonance) will help the student to enhance communication skills, using proper international anatomical terminology (FICAT) to describe normal structures of the human body. The study of gross anatomy, radiological, clinical, and microscopic anatomy is propaedeutic to the study of following classes and mandatory to comprehend the importance of superficial landmarks for deep anatomical structures.

LEARNING OUTCOMES

At the end of the class, the student must be able to: describe the gross anatomy tables, radiological imaging (CT and MRI), and the structures composing the human body using the correct anatomical terminology. The student needs to: know the organization of the body regions, the macro and microscopic structure of the organs, and the relations between them; be able to use the knowledge acquired during the course to study disciplines that illustrate the functional aspects of the human body. These outcomes are necessary to understand the relation between signs/symptoms of diseases and the patient's anatomy.

COURSE SYLLABUS

<u>VERTEBRAL COLUMN</u>

A medical student should be able to:

1. Describe the main anatomical features of a typical vertebra. Identify the atlas, axis, typical cervical, thoracic, lumbar vertebrae and sacrum and recognize their characteristic features.
2. Describe the structures, regions, and functions of the vertebral column. Describe the range of movement of the entire vertebral column and its regions. Explain what makes spinal injuries stable and unstable.
3. Describe the anatomy of intervertebral facet joints and intervertebral discs. Explain the role of the discs in weight-bearing by the vertebral column and give examples of common disc lesions, and how they may impinge upon spinal nerve roots and/or the spinal cord.
4. Describe the anatomy of a spinal nerve (e.g. as exemplified by a thoracic spinal nerve, including its origin from dorsal and ventral spinal roots, its main motor and cutaneous branches, and any autonomic component.

5. Identify the muscle and ligaments of the vertebral column and surface features to be able to perform an examination of the back, discuss their functional role instability and movement of the vertebral column.
6. Describe the anatomical relationships of the meninges to the spinal cord and dorsal and ventral nerve roots, particularly concerning root compression and the placement of epidural and spinal injections. Describe the anatomy of lumbar puncture.
7. Interpret standard diagnostic images of the vertebral column and be able to recognize common abnormalities.

UPPER LIMB

A medical student should be able to:
1. Describe and demonstrate the main anatomical landmarks of the clavicle, scapula, humerus, radius, and ulna. Recognize the bones of the wrist and hand and their relative positions, identify those bones that are commonly damaged (scaphoid and lunate).
2. Describe the close relations of the bones and joints (e.g. bursae, blood vessels, nerves ligaments and tendons), which may be injured by fractures or dislocation and predict what the functional effects of such damage might be.
3. Describe the fascial compartments delimiting the muscles of the upper limb. Explain the functional importance of those compartments and their contents.
4. Describe the origin, course and distribution of the arteries and their branches that supply the shoulder, arm and forearm in relation to common sites of injury. Explain the importance of anastomoses between branches of these arteries at the shoulder and in the upper limb.
5. Demonstrate the sites at which pulses in the brachial, radial and ulnar arteries may be located.
6. Describe the courses of the veins of the upper limb; classify and contrast the functions of the deep and superficial veins. Identify the common sites of venous access and describe their key anatomical relations. Explain the relationship between venous and lymphatic drainage channels.
7. Describe the organization of the brachial plexus, its origin in the neck and continuation to the axilla and upper limb.
8. Describe the origin, course and function of the axillary, radial, musculocutaneous, median and ulnar nerves in the arm, forearm, wrist and hand. Name the muscles that these nerves supply as well as their sensory distribution. Predict the consequences of injury to these nerves and describe how to test their functional integrity.
9. Describe the boundaries of the axilla. List its contents, including the vessels, parts of the brachial plexus and lymph node groups.
10. Describe the movements of the pectoral girdle; identify the muscles responsible for its movements and summarize their main attachments and somatic motor nerve supply.
11. Describe the factors that contribute to the stability of the shoulder joint and explain the functional and possible pathological consequences of its dislocation.
12. Describe the anatomy of the elbow joint. Demonstrate the movements of flexion and extension identify the muscles responsible for these movements and summarize their main attachments and somatic motor nerve supply.
13: Describe the anatomy of the superior and inferior radio-ulnar joints. Explain the movements of supination and pronation; identify the muscles responsible for these movements and summarize their attachments and somatic motor nerve supply.
14. Describe the anatomy of the wrist. Describe and demonstrate movements at these joints and name and identify the muscles responsible for the movements. Describe the relative positions of the tendons, vessels and nerves at the wrist in relation to injuries.

15. Name and demonstrate the movements of the fingers and thumb. Describe the position, function and nerve supply of the muscles and tendons involved in these movements, differentiating between those in the forearm and those intrinsic to the hand.
16. Explain the main types of grip (power, precision and hook) and the role of the muscles and nerves involved in executing them.
17. Describe the position and function of the retinacula of the wrist and the tendon sheaths of the wrist and hand. Explain carpal tunnel syndrome and the spread of infection in tendon sheaths.
18: Explain why and describe where the axillary, musculocutaneous, radial, median and ulnar nerves are commonly injured and be able to describe the functional consequences of these injuries.
19. Explain the loss of function resulting from injuries to the different parts of the brachial plexus. Demonstrate how to test for motor and sensory nerve function.
20. Describe the anatomical basis of: the assessment of cutaneous sensation in the dermatomes of the upper limb, tendon jerk testing of biceps and triceps and comparative strength tests.
21. Describe the anatomy of the axillary lymph nodes and explain their importance in the lymphatic drainage of the breast and the skin of the trunk and upper limb and the spread of tumors.
22. Interpret standard diagnostic images of the upper limb and be able to recognize common abnormalities

LOWER LIMB

A medical student should be able to:
1. Recognize the features and surface landmarks of the pelvis, femur, tibia, fibula, ankle and foot. Demonstrate their palpable and imaging landmarks. Appreciate which bones and joints are vulnerable to damage and what the consequences of such damage could be.
2. Describe the close relations of the bones and joints (e.g. bursae, blood vessels, nerves ligaments and tendons), which may be injured in fractures or dislocations and predict what the functional effects of such damage would be.
3. Describe the fascial compartments enclosing the muscles and explain the functional importance of these compartments and their contents in relation to compartment syndromes.
4. Demonstrate the origin, course and branches of the arteries that supply the hip, gluteal region, thigh, leg, ankle and foot. Explain the functional significance of anastomoses between branches of these arteries at the hip and knee.
5. Demonstrate the locations at which the femoral, popliteal, dorsalis pedis and posterior tibial pulses can be felt.
6. Demonstrate the course of the principal veins of the lower limb. Explain the role of the perforator vein connections between the superficial and deep veins and the function of the 'muscle pump' for venous return to the heart. Describe the sites of venous access.
7. Outline the origin of the lumbosacral plexus and the formation of its branches.
8. Describe the origin, course and function of the sciatic, femoral, obturator, common peroneal and tibial nerves, sural and saphenous nerves and summarize the muscles that each supply as well as their sensory distribution.
9. Describe the structure and movements of the hip joint. Summarize the muscles responsible for these movements, their innervation and main attachments.
10. Describe the structures responsible for the stability of the hip joint and their relative contribution to maintaining the lower limb in different positions.

11 Describe the structures at risk from a fracture of the femoral neck or dislocation of the hip and explain the functional consequences of these injuries.
12. Describe the boundaries of the femoral triangle and the anatomical relationships of the femoral nerve, artery, vein and lymph nodes to each other and to the inguinal ligament, with particular regard to arterial blood sampling and catheter placement.
13. Describe the anatomy of the gluteal (buttock) region and the course of the sciatic nerve within it. Explain how to avoid damage to the sciatic nerve when giving intramuscular injections.
14. Describe the structure and movements of the knee joint. summarize the muscles responsible for these movements, their innervation and main attachments.
15. Describe the close relations of the knee joint including bursae and explain which structures may be injured by trauma (including fractures and dislocation) to the knee. Identify the factors responsible for maintaining the stability of the knee joint. Describe the menisci, ligaments and the locking mechanism close to full extension. Explain the anatomical basis of tests that assess the integrity of the cruciate ligaments. Describe the boundaries and contents of the popliteal fossa.
16. Describe the anatomy of the ankle joint. Explain the movements of flexion, extension, plantarflexion, dorsiflexion, inversion and eversion. Describe the muscles responsible for these movements, their innervation and their attachments.
17. Describe the factors responsible for the stability of the ankle joint, especially the lateral ligaments, and explain the anatomical basis of “sprain” injuries.
18. Describe the arches of the foot and the bony, ligamentous and muscular factors that maintain them.
19. Describe the movements of inversion and eversion at the subtalar joint, the muscles responsible, their innervation and main attachments.
20. Describe the anatomical basis (nerve root or peripheral nerve) for loss of movements and reflexes at the knee and ankle resulting from spinal injuries, disc lesions and common peripheral nerve injuries. Describe the dermatomes of the lower limb and perineum used to assess spinal injuries.
21. Describe the structures at risk of a fracture of the femoral neck or dislocation of the hip and describe the functional consequences of these conditions.
22. Describe the lymphatic drainage of the lower limb and its relationship to tumor spread.
23. Discuss the structures of the lower limb that may be used for autografts.
24. Interpret standard diagnostic images of the lower limb and be able to recognize common abnormalities.

HEAD AND NECK

A medical student should be able to:
1. Demonstrate the position, palpable and imaging landmarks of the bones of the skull, including the frontal, parietal, occipital, temporal, maxilla, zygoma, mandible, sphenoid, nasal and ethmoid bones. Demonstrate the palpable position of the hyoid bone, thyroid and cricoid cartilages, lateral mass of the atlas and the spine of C7. Demonstrate the sutural joints and describe the fontanelles of the fetal skull.
2. Describe the boundaries, walls and floors of the cranial fossae.
3. Identify the external and internal features of the cranial foraminae and list the structures that each transmits.
4. Demonstrate the position of the anterior and posterior triangles of the neck defined by the sternum, clavicle, mandible, mastoid process, trapezius and sternocleidomastoid.

5. In the posterior triangle, demonstrate the position of the spinal accessory nerve, the roots and trunks of the brachial plexus, the external jugular vein and subclavian vessels in relation to penetrating neck trauma.
6. In the anterior triangle, demonstrate the position of the common, internal and external carotid arteries, the internal jugular vein and vagus nerve, the trachea, thyroid cartilage, larynx, thyroid and parathyroid glands. Explain their significance in relation to carotid insufficiency, central venous line insertion, emergency airway management and diagnosis of thyroid disease.
7. Describe the location and anatomical relations of the thyroid and parathyroid glands, their blood supply and the significance of the courses of the laryngeal nerves.
8. Demonstrate the origin, course and branches of the common, internal and external carotid arteries and locate the carotid pulse.
9. Describe the courses of the accessory, vagus and phrenic nerves in the neck.
10. Identify the structures passing between the neck and the thorax. Describe the courses and relationships of the subclavian arteries and veins.
11. Describe the anatomy of the scalp, naming its individual layers. Describe the blood supply of the scalp and its significance in laceration injuries.
12. Demonstrate the extracranial course of the branches of the facial nerve. Describe the muscles of facial expression supplied by each branch and describe the consequences of injury to each branch.
13. Describe the intracranial and intrapetrous course of the facial nerve and the relationships of its branches to the middle ear in relation to damage of the nerve within the facial canal.
14. Describe the anatomy of the temporomandibular joint. Explain the movements that occur during chewing and describe the muscles involved including their innervation. Explain what occurs in anterior joint dislocation and relocation.
15. Describe the origin, function and branches of the sensory and motor components of the trigeminal nerve.
16. Describe the origins and summarise the courses and major branches of the facial and maxillary arteries, including the course and intracranial relations of the middle meningeal artery and its significance in extradural hemorrhage.
17. Describe the relationship of the termination of the facial vein (draining into the internal jugular vein) and the mandibular branch of the retromandibular vein (supplying facial muscles controlling the angle of the mouth) to the submandibular gland and related upper jugular lymph nodes in relation to exploration of this area.
18. Describe the key anatomical relations of the parotid, submandibular and sublingual salivary glands, the course of their ducts into the oral cavity and their autonomic secretomotor innervation. Appreciate the narrow points of the ducts in relation to salivary stone impaction.
19. Demonstrate the features and boundaries of the oral cavity and describe its sensory innervation.
20. Describe the functional anatomy of the tongue, including its motor and sensory innervation and the role of the extrinsic and intrinsic muscles. Explain the deviation of the tongue after hypoglossal nerve injuries.
21. Describe the anatomical arrangement and functional significance of the lymphoid tissue in the tonsils, pharyngeal, and posterior nasal walls.
22. Describe the muscles that compose the pharyngeal walls and move the soft palate; summarise their functions and nerve supply. Describe the components of the gag reflex.
23. Describe the hyoid bone and cartilages of the larynx. Explain how these structures are linked together by the thyrohyoid, cricothyroid, and quadrangular membranes.

24. Describe the intrinsic and extrinsic laryngeal muscles responsible for closing the laryngeal inlet, controlling vocal cord position and tension. Explain how these muscles function during phonation, laryngeal closure, the cough reflex and regulation of intrathoracic pressure.
25. Describe the origin, course and functions of the motor and sensory nerve supply of the larynx and the functional consequences of injury to them.
26. Describe the stages of swallowing and the functions of the muscles of the jaw, cheek, lips, tongue, soft palate, pharynx, larynx and oesophagus during swallowing.
27. Describe the location, actions and nerve supply of the intrinsic and extra-ocular muscles and apply this knowledge to explain the consequences of injury to the nerve supply of these muscles.
28. Describe the anatomy of the eyelids, conjunctiva and lacrimal glands. Explain their importance for the maintenance of corneal integrity.
29. Describe the functional anatomy of the external auditory meatus, tympanic membrane, ear ossicles and auditory tube, together with their major anatomical relations.
30. Describe the bones of the nasal cavity and the major features of the lateral wall of the nasal cavity. Describe the major arteries that supply the lateral wall and nasal septum in relation to nosebleeds.
31. Name the paranasal sinuses, describe their relationships to the nasal cavities and sites of drainage on its lateral wall and explain their innervation in relation to referred pain.
32. Describe the arrangement of the dura mater, and its main reflections within the cranial cavity and their relationship to the major venous sinuses and the brain itself.
33. Describe the arrangement of the venous sinuses of the cranial cavity; explain the entrance of cerebral veins into the superior sagittal sinus in relation to subdural hemorrhage, and how connections between sinuses and extracranial veins may permit intracranial infection.
34. Describe the relationships between the brain and the anterior, middle and posterior cranial fossae.
35. Describe the anatomy of the motor and sensory nerves to the head and neck and apply this to a basic neurological assessment of the cranial nerves and upper cervical spinal nerves.
36. Describe the sympathetic innervation of the head and neck and the features and casual lesions in Horner's syndrome.
37. Demonstrate the positions of the external and internal jugular veins and the surface landmarks that are used when inserting a central venous line.
38. Describe the arrangement of the lymphatic drainage of the head and neck, the groups of lymph nodes and the potential routes for the spread of infection and malignant disease.
39. Interpret standard diagnostic images of the head and neck and be able to recognize common abnormalities.
40. Describe the anatomical microscopical structure at light and electron microscopy level of all head and neck viscera

COURSE STRUCTURE

Teaching is organized in lectures and training exercises (70 hours). During the lectures illustrative images of the various anatomical sections will be showed and, videos of gross anatomy dissection and clinical landmarks will be employed to facilitate the understanding of the tridimensional arrangement of the structures. During training exercises the students will describe anatomic structures and microscopic samples regarding topics of the previous lectures.

COURSE GRADE DETERMINATION

In order to evaluate knowledge and achievement of the objectives, the student must (1) be able to recognize anatomical images and parts of them, on figures, cadaveric images, radiological images, according to international anatomical terminology (FICAT) (2) be able to recognize microscopic anatomical preparations, (3) describe orally what is reported in the program. The three parts are a whole in terms of evaluation and are not considered separate parts.
If the examination will be held online Google Meet platforms will be used.

OPTIONAL ACTIVITIES

The learning process will be constantly supported by the professor during and at the end of the class to clarify the students' doubt on demand.

READING MATERIALS

- Gray's Anatomy for Students 4th Edition. Authors: Richard Drake A. Wayne Vogl Adam Mitchell. Imprint: Elsevier. Published Date: 22nd February 2019.
- Gray's Anatomy 42nd Edition The Anatomical Basis of Clinical Practice. Editor in Chief: Susan Standring. Imprint: Elsevier. Published Date: 21st October 2020.
- Atlas of Anatomy 4th edition. Authors: Gilroy, MacPherson, Wikenheiser, Schuenke, Schulte, Schumacher. Imprint: Thieme. Published Date: June 2020.
- The Central Nervous System 5th Edition. Author: Per Brodal. Imprint: Oxford University Press. Published Date: 16th July 2016.
- Histology: A Text and Atlas: With Correlated Cell and Molecular Biology. Authors: Pawlina, Wojciech, Ross, Michael H. Imprint: Wolters Kluwer. Published Date: 27th December 2018.