GENERAL ANATOMY

COURSE CONTENT

COMPETENCIES

The first year medical student should be able to describe the general features of skin, fascia, bones, joints, vessels & nerves and be able to differentiate these structures in gross specimens, correlate the clinical conditions with general anatomy.

DESCRIPTIVE TERMS

A. Terms used for describing the position of the body:
Anatomical, supine, prone, lithotomy

B. Anatomical planes: Median or sagittal, parasagittal, coronal, transverse, oblique

C. Commonly used terms in gross anatomy: Anterior, posterior, superior, inferior, medial, lateral

D. Terms used in embryology: Ventral, dorsal, cranial / cephalic or rostral, caudal

E. Terms related to limbs: Proximal, distal, radial, ulnar, tibial, fibular, preaxial & postaxial borders, flexor, extensor, palmar & plantar surfaces

F. Certain other terms

- **a. Terms used for hollow organs:** Interior, exterior, invagination, evagination
- **b. Terms used for solid organs:** Superficial, deep
- **c. Terms used to indicate the side:** Ipsilateral, contralateral

G. Terms used for describing muscle: Attachments or origin and insertion, belly, tendon, aponeurosis, raphe

H. Terms used for describing movements: Flexion, extension, adduction, abduction, medial rotation, lateral rotation, circumduction, pronation, supination, protraction, retraction, inversion, eversion, fixation, opposition, reposition, plantar flexion, dorsiflexion

BONE

Definition, nutrition
Classification

A. Morphological: Long, short, miniature long, flat, irregular, pneumatic, sesamoid, accessory

B. Structural: Compact, spongy

C. Developmental: Membranous, cartilaginous

D. Microscopic: Nonlamellar, lamellar

E. Regional: Appendicular, axial

Distribution and Functions of bone; Structure of long bone in details: Parts of a long bone: Diaphysis, metaphysis, epiphysis

Types of epiphysis: Pressure, traction, atavistic, composite, compound, aberrant

Ossification: Primary & secondary centres - definition, Law of ossification, epiphyseal plate, blood supply of long bone

Level 2: Nutrition, mechanical properties

Level 3: Effect of hormones on growth, stresses and strains (Wolff's law), effect of radiation on bone, why metastases occur in bone? Factors concerned with growth of bone; medicolegal importance of bones - age, sex, height, injuries, poisoning, causes of death, superimposition of skull X-ray and photograph

CARTILAGE

Definition, classification, structure, distribution
Level 2: Nutrition, synthesis, histogenesis, growth
Level 3: Grafts

JOINTS

Classification

I. Based on movement: Synarthrosis, amphiarthrosis, diarthrosis

II. Based on nature of articulating medium

A. Synarthroses (Solid)

1. Fibrous

a. Sutures: serrate, denticulate, plane, squamous, limbous, schindylesis
b. Gomphosis
c. Syndesmosis

2. Cartilaginous: Primary, secondary
Level 2: Factors limiting range of movement, Functional correlation
Level 3: Surface topology of articular surfaces - ovoid, sellar; Types of movement - Spin, swing- pure(cardinal), impure (arcuate associated with spin)

B. Diarthroses (Cavitated) Synovial

Axes of movements,
Structure of typical synovial joints

Classification of synovial joints

According to the shape of the articulating surfaces : Plane, ball and socket, hinge, ellipsoid, pivot, saddle, bicondylar

According to the axis of movement : Uniaxial, biaxial & multiaxial

General morphology :

1. Simple - One pair - male, female surfaces
2. Compound - More than one pair of surfaces
3. Complex - With intracapsular menisci/articular disc

Level 2:

Kinesiologically: Sellar, ovoid
Types of movement :Translation, rotation, angulation,
Joint position: Loose-packed, close-packed

Blood supply and nerve supply of joints

MUSCLE

Definition

Types: Skeletal, cardiac, smooth

Skeletal muscle : Origin, insertion (attachments)

Morphological classification

A. Parallel fasciculi - Quadrilateral, strap, strap with tendinous intersections, fusiform, digastric, bicipetal, tricipital
B. Oblique fasciculi - Triangular, unipennate, bipennate, multipennate, circumpennate (radial)
C. Cruciate muscle

D. Spiral fasciculi
Actions of muscles
Isotonic, isometric, concentric, eccentric
Level 2: Power of muscles : Number and diameter of fibres, range of contraction 40 % contraction, active insufficiency ,passive insufficiency, structure and functional correlation
Level 3: Body lever system

Functional classification
Prime movers, fixators, antagonists, synergists
Level 2: Shunt, swing and spin components of muscle
Level 3: Kinesiology

Distribution, structure , blood supply and nerve supply; Neuromuscular junctions

SKIN

Introduction : Major organ of the body, surface area 1.2 to 2 sq. metres

Types : Thin hairy skin (Scalp - based on epidermis), Thick hairless (Palm - based on epidermis)

Structure : Epidermis, dermis - papillary and reticular layers, pigmentation
Level 2 : Structural and functional correlation
Level 3 : Clinical correlation, significance of Langer's lines, skin grafts

Skin lines, Appendages - nails, hair, sweat glands, sebaceous glands
Level 2: Tension lines, flexure lines, papillary ridges
Functions
Innervation

DERMATOMES

Definition, dermatomes of trunk, superior and inferior extremities, axial lines
Level 2 : Applied anatomy

SUPERFICIAL FASCIA

Definition
Structure
Distribution of fat, important structures, functions
Level 2: Structural and functional correlation
Level 3: Applied and comparative anatomy

DEEP FASCIA

Definition, distribution, important features, modifications, functions
Level 2: Details, structural and functional correlation
Level 3: Calf pump

BURSA

Definition, structure, functions
Types: Communicating, non-communicating, subcutaneous, subfascial, subtendinous, submuscular, interligamentous
Level 2: Adventitious bursae - housemaid's knee, clergyman's knee, student's elbow, weaver's bottom, porter's shoulder

Level 3: Bursitis

LIGAMENTS

Definition
Types :
A. According to structure: Collagen fibres, elastic fibres
B. According to relation to joints: Intrinsic, extrinsic

Blood supply

Nerve supply

Functions

Applied - Sprains
Level 2 : Structural and functional correlation; bed for nerve
Level 3 : Sprain

RETINACULA

Definition, structure; flexor, extensor, peroneal retinacula; functions

APONEUROSES

Definition; palmar, plantar, bicipital, aponeurosis of abdominal muscles, epicranial aponeurosis; functions

TENDON

Definition, structure, distribution
Level 2: Collagen fibres parallel arrangement, blood supply, function
Level 3: Transplant

BLOOD VASCULAR SYSTEM

Introduction to arteries: elastic, muscular; arterioles; capillaries: continuous and fenestrated capillaries; sinusoids, veins - four types : caval, portal, azygos, paravertebral; anastomosis: interarterial, arteriovenous anastomosis, end arterial; vasa vasorum, nerve supply of blood vessels
Level 2: Gradient of blood pressure in different blood vessels
Level 3: Collateral circulation, Functional end arteries, arteriosclerosis, ischaemia, infarct

LYMPHATIC SYSTEM

Drainage system accessory to the venous system
Components : Lymph vessels, central lymphoid tissue, peripheral lymphoid organs, circulating lymphocytes - T and B lymphocytes
Level 2: Functions
Level 3: Applied anatomy, infections

NERVOUS TISSUE

Structure of nervous and supporting tissue
Neurons: Cell body, axon, dendrites, myelination, myelin sheath
Synapses : Structural - type I and II; Functional - excitatory and inhibitory
Level 2 : Functional correlation

Level 3: Nerve injuries, regeneration, reflexes

Classification of neurons :
1. According to polarity : Unipolar, pseudounipolar, bipolar, multipolar
2. According to function : Sensory or receptor neurons, internuncial or connector, motor or efferent
3. According to relative lengths of axons and dendrites: Golgi type I, Golgi type II

Neuroglia:
Fibrous astrocytes, protoplasmic astrocytes, oligodendrocytes, microglia, ependyma

Nerves : Cranial - 12 pairs, Spinal - 31 pairs (8 cervical, 12 thoracic, 5 lumbar, 5 sacral & 1 coccygeal)
Structure of typical spinal nerve - ventral root and dorsal, root unite to form spinal nerve which divides into ventral and dorsal rami; ventral rami form plexuses

Autonomic nervous system :
Sympathetic :
Sympathetic ganglia, grey rami and white rami communicans; preganglionic and postganglionic fibres, peri-arterial plexuses; splanchnic ganglia and splanchnic nerves
Parasympathetic : Cranial outflow, sacral outflow

RADIOLOGICAL ANATOMY

1. Principles of plain radiograms, CT scan, USG, MRI, Newer imaging modalities
2. Identification of gross anatomical features in plain and contrast radiographs
3. Identification of gross anatomical features in normal CT scan, USG, MRI

Level 2
1. Identification of anatomical features in details in plain radiographs
2. Anatomical basis for diagnostic procedures. Technical details (e.g. dye) are not necessary
3. Estimation of age if epiphyseal line seen

Level 3
1. Integration of the radiogram with Anatomy, Physiology and Biochemistry
2. Historical aspects of imaging techniques

LOCOMOTION, KINESIOLOGY AND OTHER FUNCTIONAL ANATOMY

1. Posture
Definition, types; criteria of good posture; line of gravity; weight transmission; maintenance of posture, postural muscles
Level 3: Joint and lever comparison

2. Vertebral column
Formation, joints, ligaments
A. Normal curvatures - Primary, secondary
B. Abnormal curvatures - Kyphosis, scoliosis, lordosis, kyphoscoliosis
Intervertebral disc: Structure - nucleus pulposus and annulus fibrosus; functions
Level 3: Applied - Prolapsed intervertebral disc, spondylosis, spondylitis, spondololysis, spondylolisthesis

3. Grips of the hand : Power grip, precision grip, hook grip, pincers grip, simultaneous power and precision grip, complex manipulation
Level 3: Day to day use of hand, indispensible parts of the hand

4. Walking : Walking cycle or gait cycle: Stance phase, swing phase

5. Anatomy of speech : Larynx is the primary source but also includes pharynx, mouth, tongue, nasal cavities; production of sound and articulation; consonants associated with particular anatomical site e.g. labials, dentals, nasals

Deglutition, Coughing, Sneezing, Vomiting, Micturition, Defaecation, Ejaculation, Facial expression, Blinking.

LECTURES

- Introduction to Dissection
- Introduction to Microanatomy
- Epithelial tissue – Classification; functions and specializations
- Epithelial tissue – Glands; serosa, mucosa
- Connective tissue – Classification; fascia – superficial & deep
- Connective tissue – Haemolymphoid tissue
- Connective tissue – Cartilage
- Connective tissue – Bone - Classification, examples
- Connective tissue – Bone - Blood supply of long bone, applied anatomy
- Connective tissue – Joints - Classification, synarthrosis
- Connective tissue – Joints - Typical synovial, subtypes
- Connective tissue – Joints - Kinesiological classification
- Muscular tissue – Basic classification; morphological classification
- Muscular tissue – Functional classification
- Muscular tissue – Kinesiological classification
- Muscular tissue – Vector analysis of muscle movement
- Nervous tissue – Classification of nervous system, neurons, fibres
- Nervous tissue – Classification of synapses; receptors; NM junction
- Vessels – Functional classification; structural & functional correlation
- Vessels – Anastomosis, endarteries, collateral circulation, lymphatics
- Dermatomes and myotomes of upper and lower limb
- Locomotion - Normal gait
- Locomotion - Abnormal gait
- Vertebral column - Curvatures; Intervertebral disc
- Vertebral column - Movements; Applied anatomy
- Posture