INTRODUCTION TO ANATOMY

"ANATOMY IS TO PHYSIOLOGY AS GEOGRAPHY IS TO HISTORY"
(Fernel)

By. Paryono
LEARNING OBJECTIVES

You are able to:

- Define the word anatomy.
- Describe the origin and meaning of anatomy.
- Describe the historical views of anatomy.
- Describe the major subdivisions of anatomy.
- Describe the major methods/approaches used in studying anatomy.
- Understand descriptive terms used in anatomy.

WHAT IS ANATOMY?

- Anatomy (Greek: *ana*: apart; *temmein*: to cut) "Cutting up apart" (Latin equivalent: *dissecare* → dissection)

Anatomy (Discipline/field of scientific study)

Dissection (One of the methods/techniques used in studying the body)
WHAT IS ANATOMY?

ANATOMY

- The part of biological science that deals primarily with structure and function of the body
- The study of living human beings
  - Cannot be learned completely by studying the bodies of dead persons
- The basis of medical language

Studying Anatomy

MEMORISING (New language: 4500 words) vs UNDERSTANDING

- The study of etymology (derivation of words)
  - Helps remember anatomy and find the process enjoyable
- Cecum → caecus (Lat.): blind
  - The cecum is a blind pouch lying inferior to the terminal portion of ileum (Lat.: roll up/twist)
  - The ileum is a highly coiled/rolled up part of the small intestines

The links between structure & function
- Intellectually more satisfying
- It makes its long term retention easier
MACROANATOMY
(Macroscopic/Gross Anatomy)

Cadaver (dead body)/
Descriptive Anatomy
Dissection: - demonstration of the part the body - 3D conception

Living human (in vivo)/
(Living Anatomy)
Observation, palpation, percussion, auscultation

HISTORICAL REMARKS

Anatomy originated in Egypt
- Greece (middle of 4th Century BC)
  - Hippocrates: “Father of Medicine”
    - Hippocratic Oath
      - “The nature of the body is the beginning of medical science”
  - Aristotle (384-322 BC):
    - Physician and scientist
    - The founder of: Comparative Anatomy
      - Developmental Anatomy (Embryology)
    - The word anatome (to dissect)

- Discovery of X-ray → Radiographic Anatomy
- Discovery of radiant energy → Organ Imaging
GENERAL SUBDIVISIONS OF ANATOMY

MACROANATOMY
(Macroscopic/Gross Anatomy)
Included: SURFACE ANATOMY
- Observation,
- palpation, percussion,
- auscultation

MICROANATOMY
- Microscope

CYTOLOGY
- cells

HISTOLOGY
- tissues

EMBRYOLOGY
- Development of the structures

COMPARATIVE ANATOMY
- Examine the structures of other animals

SUBDIVISIONS OF ANATOMY ACCORDING TO THEIR APPROACHES

MACROANATOMY
(Macroscopic/Gross Anatomy)
- Macroscopic/Dissection
- Microscopic structure and function
- The cells
- The make up of the tissues/ organs

MICROANATOMY
(Microscopic Anatomy)
- Cytology
- Histology

-TOPOGRAPHICAL ANATOMY
- REGIONAL ANATOMY
- Location of the body structures -
- Structures in the regions of the body

- SYSTEMIC ANATOMY
- FUNCTIONAL ANATOMY
- Interrelation of the body systems (structures – functions)
SUBDIVISIONS OF ANATOMY ACCORDING TO THEIR APPROACHES (continued)

- **DEVELOPMENTAL ANATOMY**
  Growth and development (changes of developing structures)
  (Embryology ↔ Prenatal life (embryonic period 4-8 wks)

- **NEUROANATOMY**
  Structure and function of the Nervous system (Gross, microscopic, developmental, radiological)

- **RADIOLOGICAL/RADIOGRAPHIC ANATOMY**
  Using radiographic technique

- **COMPARATIVE ANATOMY**
  Comparing the structures of various animals

THE SYSTEMS OF THE BODY

Functional standpoints

1. Integumentary System (skin and appendiges)
2. Skeletal System (bones and cartilages)
3. Muscular System (skeletal muscles, move the joints)
   (Musculoskeletal System (2+3+4, function: Locomotion)
4. Articular System (joints/articulations, its associated bones and ligaments)
5. Nervous System (brain, spinal cord, nerves, ganglia)
6. Circulatory System /Cardiovascular System (heart, blood vessels, lymphatic system: nodes and vessels)
7. Digestive System (from mouth to anus, and glands)
8. Respiratory System (from nose to lungs: O2 – CO2 exchange)
9. Urinary System (kidney, urinary bladder, excretory passages)/elimination of waste products
10. Reproductive System (perpetuation of the human species)
11. Endocrine System (ductless glands: produce hormones)
INTEGUMENTAL SYSTEM

SKELETAL SYSTEM

MUSCULAR SYSTEM

FIGURE 3.6
The human skeletal system, showing some of the major bones.

FIGURE 3.7
The human muscular system, showing some of the major skeletal muscles.
FIGURE 1.14 EXCRETORY SYSTEM
The urinary system consists of the kidneys that produce urine, ducts (tubules) that carry urine to the bladder, where it is stored, and the urethra, which conveys urine to the outside.

FIGURE 1.15 ENDOCRINE SYSTEM
The human endocrine system, showing the location of the major ductless glands:
- Hypothalamus
- Pineal gland
- Pituitary
- Pancreas
--parathyroid
- Thyroid gland
- Adrenal gland
- Parathyroid
- Kidney
- Ovary (in female)
- Testis (in male)

FIGURE 1.16 REPRODUCTIVE SYSTEM
(a) The female reproductive system.
(b) The male reproductive system. The reproductive systems have been enlarged for emphasis.
• DISSECTION (Cadaver)
• SURFACE ANATOMY (Living body) (observation, palpation, percussion, auscultation)
• ENDOSCOPY (Living body: internal structures)/invasive
• ORGAN IMAGE (noninvasive, nondestructive)

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**RADIOLOGY**
- X-ray (radiographs, contrast media, tomography, computer-assisted tomography/CAT/CT)

**ULTRASONOGRAPHY**
- Ultrasound wave

**MAGNETIC RESONANCE IMAGING (MRI)**
- Electromagnetic wave

**RADIOISOTOPE IMAGING**
- Uptake of isotope radioactive

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*N Nuclear MRI (NMRI): PET (Positron Emission Tomography)
SPECT (Single Proton Computed Tomography)

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**THE MAJOR PARTS OF THE BODY**

[Diagram showing major parts of the body]
ADULT STRUCTURES
(Based on embryonic development)

- **SOMATIC STRUCTURES**
  - Skeleton
  - Skeletal muscles (and associated connective tissues)
  - Skin

- **VISCERA**
  - Internal organs (heart, lungs, GI tract)

- **PHARYNGEAL/BRANCHIAL STRUCTURES**
  - (Branchial arches: a series of skeletal arches develop in the wall of pharynx)
    - (each pharyngeal arch contains: skeletal muscles, blood vessels, and nerves)
  - Derivatives:
    - Lower jaw (mandible)
    - Muscles of the head, neck, pharynx, and larynx

THE ANATOMICAL POSITION

Description of the body based on the assumption of the anatomical position

* Directions
* Relation of the parts of the body

A person in anatomical position is standing erect with the head, eyes and toes directed forward, heels and the toes together, and the upper limbs hanging by sides with the palms facing anteriorly
PLANES OF THE BODY

- **SAGITTAL PLANE**: (parallel to the median plane)
- **MEDIAN PLANE**: (right/left halves)
- **CORONAL PLANE**: (right angle of the median plane)
- **HORIZONTAL PLANE**: (right angle of sagittal and coronal planes) (superior or upper/ inferior or lower)

- **VERTICAL PLANE**: (parallel to the median plane) Parasagittal/ Paramedian plane → right/left

antior or ventral/ posterior or dorsal
Figure 3. Drawings illustrating the **median and sagittal planes** of the body, two of the four anatomical planes. Observe that the median plane is a vertical plane passing through the body from front to back, dividing it into equal and superficially symmetrical right and left halves. Understand that there are many sagittal planes, because a sagittal plane is any vertical plane passing through the body parallel to the median plane. The sagittal plane that passes through the median plane is also called the mid-sagittal plane. It is a common error to refer to the “midline” of the body when the median plane is meant.
Figure 4. Drawings illustrating the coronal and horizontal planes. A coronal plane is any vertical plane passing through the body at right angles to the median plane. The coronal plane is also referred to as the frontal plane. A horizontal plane is any plane passing through the body at right angles to both the median and coronal planes (i.e., parallel to the surface on which the subject is standing). Note that the coronal plane of the feet shown here does not pass through the trunk of the body. Coronal planes of the body pass through the ankles.
TERMS OF RELATIONSHIP

(DIRECTIONAL TERMS/
TERMS OF COMPARISON)

(to describe:
- relationship of parts of the body in the
  anatomical position
- the location of structures in the body with
  reference to the anatomical position
- comparison of the relative position of two
  structures each other)

Figure 5. Diagrams illustrating oblique (A) and transverse (B) sections of the lower and upper limbs, respectively.
TERMS OF RELATIONSHIP

- Various terms are used to describe the relationship of parts of the body in the anatomical position.

- The terms listed below are used to indicate the location of structures in the body with reference to the anatomical position, irrespective of the position of the body of the patient or the cadaver.

Commonly used directional terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior</td>
<td>Toward the head</td>
<td>The heart is superior to the stomach</td>
</tr>
<tr>
<td>Inferior</td>
<td>Toward the feet</td>
<td>The stomach is inferior to the heart</td>
</tr>
<tr>
<td>Anterior</td>
<td>Nearer to the front of the body</td>
<td>The sternum is anterior to the heart</td>
</tr>
<tr>
<td>Posterior</td>
<td>Nearer to the back of the body</td>
<td>The heart is posterior to the sternum</td>
</tr>
<tr>
<td>Medial</td>
<td>Nearer to the median plane of the body</td>
<td>The ulna is on the medial side of the forearm</td>
</tr>
<tr>
<td>Lateral</td>
<td>Farther away from the median plane of the body</td>
<td>The radius is on the lateral side of the forearm</td>
</tr>
</tbody>
</table>
Proximal | Nearer the attachment of a limb or a structure | The elbow joint is proximal to the wrist joint

Distal | Farther from the attachment of a limb or a structure | The wrist joint is distal to the elbow joint

Superficial | Nearer to the surface | The muscles of the arm are superficial to the bone

Profundal/ deep | Farther from the surface | The humerus is deep/profundal to the muscles of the arm

Parietal | Pertaining to the outer wall of a body cavity | The parietal pleura lines the inside of the thoracic wall

Visceral | Pertaining to the covering of an organ | The visceral pleura covers the surface of the lungs

(Inferior= caudal= below; toward the feet or lower part of the body
Superior= cranial= cephalic= above
Anterior= ventral= front= rostral
Posterior= dorsal= behind

Figure 7. Diagram of an anterior view of a man standing in the anatomical position. The term medial means toward the median plane and lateral means away from the median plane of the body. The terms median and medial are sometimes confused. Median means “in the median plane,” whereas medial means “toward the median plane.”
Anatomy is concerned with living body, hence there are various terms to describe the different types of movement of the limbs and other parts of the body. Movements take place at certain joints where two or more bones meet one another.
FLEXION  Bending or making a decreasing angle between the bones or parts of the body
  (-dorsiflexion: flexion in dorsal direction (in the ankle)
  -lateroflexion: lateral bending (of the trunk)

EXTENSION  Straightening of a bent parts of the body
  (-hyperextension: movement beyond the extension)
  -plantarflexion (at the ankle joint)

ABDUCTION  Moving away from the median plane in the coronal plane (-abduction of the fingers and toes: spreading away)

ADDUCTION  Moving toward the median plane in a coronal plane
  (-adduction of the fingers: moving the fingers toward the middle finger -adduction of the toes: moving the toes toward the second toe)

OPPOSITION  The movement during which the thumb pad is brought to a finger pad

REPOSITION  The movement of the thumb from the position of opposition back to anatomical position

Figure 9. Drawings illustrating flexion and extension. A, movements of the trunk or neck in a sagittal plane are known as flexion (forward bending) and extension (backward bending). B, movements of the forearm in a sagittal plane are known as flexion and extension. In flexion the angle between the forearm and arm is reduced, whereas in extension the angle is increased. C, note that flexion of the leg at the knee joint is a posterior bending of the limb. Hyperextension is extreme or excessive extension of a limb or part. Hyperflexion is forcible overflexion of a limb or part. These movements beyond the normal range may cause injury to the joint or part (e.g., the knee joint or neck). Also see Figure 5-9.
Figure 10. Drawings illustrating movements of the thumb.

Figure 14. Drawings illustrating abduction of the right limbs in A and adduction of the left limbs in B. Observe that abduction of a limb is the movement away from the median plane of the body in a coronal plane, whereas adduction of a limb is the movement toward the median plane of the body in a coronal plane.
<table>
<thead>
<tr>
<th>Movement</th>
<th>Description</th>
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<tbody>
<tr>
<td>PROTRACTION</td>
<td>Movement anteriorly (forward)</td>
</tr>
<tr>
<td></td>
<td>(-drawing the mandible or the shoulder forward)</td>
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<tr>
<td>RETRACTION</td>
<td>Movement posteriorly (backward)</td>
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<td></td>
<td>(-drawing the mandible or the shoulder backward)</td>
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<td>ELEVATION</td>
<td>Lifting, raising or moving a part superiorly</td>
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<td></td>
<td>(-elevating the shoulder when shrugging)</td>
</tr>
<tr>
<td></td>
<td>(-raising the upper limb superior to the shoulder)</td>
</tr>
<tr>
<td>DEPRESSION</td>
<td>Letting down, lowering or moving a part inferiorly</td>
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<tr>
<td></td>
<td>(-depressing or lowering the shoulders as occurs when standing at ease)</td>
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<tr>
<td>CIRCUMDUCTION</td>
<td>Circular movement (to draw around or to form a circle)</td>
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<tr>
<td></td>
<td>The combination of successive movements of flexion, abduction, extension,</td>
</tr>
<tr>
<td></td>
<td>and adduction in such a way that the distal end of the part being moved</td>
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<tr>
<td></td>
<td>forms a circle.</td>
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<tr>
<td></td>
<td>(This sequence of movements results in a cone of movement; occur at the</td>
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<tr>
<td></td>
<td>hip, the shoulder, the wrist, and the metacarpophalangeal joints of the</td>
</tr>
<tr>
<td></td>
<td>fingers: the movement of the thumb and index finger)</td>
</tr>
<tr>
<td>ROTATION</td>
<td>Turning or revolving of a part of the body around its long axis</td>
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<tr>
<td></td>
<td>(-rotation of the humerus at the shoulder joint and the femur at the hip</td>
</tr>
<tr>
<td></td>
<td>joint)</td>
</tr>
<tr>
<td></td>
<td>Medial rotation: rotation toward the median plane of the body</td>
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<tr>
<td></td>
<td>Lateral rotation: rotation away from the median plane</td>
</tr>
</tbody>
</table>
**EVERSION OF THE FOOT**

The movement turns the plantar surface or sole of the foot away from the median plane (the foot faces laterally)

**INVERSION OF THE FOOT**

The movement turns the plantar surface or sole of the foot toward the median plane of the body (the sole faces medially)

**SUPINATION**

The movement that rotates the radius of the forearm laterally around its long axis, so that the dorsum of the hand faces posteriorly and the palm faces anteriorly when the body is in the anatomical position.

**PRONATION**

The movement that rotates the radius of the forearm medially around its long axis so that the palm of the hand faces posteriorly and its dorsum faces anteriorly when the upper limb is by the side in the anatomical position.
Figure 12. Drawings illustrating movements of the foot. A, dorsiflexion; B, plantarflexion; C, dorsiflexion and plantarflexion; D, inversion; E, normal; F, eversion. For a description of the muscles producing these movements, see Chapter 4. Also see Tables 4-12 and 4-13.

Figure 16. Drawings illustrating supination (A) and pronation (B) of the right forearm. Observe that pronation is a medial rotation of the radius from its anatomical position (A) so that the dorsum (back) of the hand faces anteriorly. Supination of the pronated forearm returns the hand to its anatomical position shown in A and in Figure 2. Note that the positions of the radius and the ulna change during pronation.
FIGURE 1.9 Dorsal and ventral body cavities and their subdivisions.

(a) Lateral view

(b) Anterior view

Key:
- Dorsal body cavity
- Ventral body cavity

FIGURE 1.11 The nine abdominopelvic regions. (a) Division of the abdominopelvic cavity into nine regions delineated by four planes. The superior transverse plane is just inferior to the ribs; the inferior transverse plane is just superior to the hip bones, and the parasagittal planes lie just medial to the nipples. (b) Anterior view of the abdominopelvic cavity showing the superficial organs.
Selamat Belajar
Semoga Sukses selalu menyertaimu