Chapter

1

Introduction

Life is a book with three chapters. Two are already written by God—birth and death. The chapter in the middle is empty; fill it with smile, love and faith.

Human anatomy is the science which deals with the structure of the human body. The term, 'anatomy', is derived from a Greek word, "anatome", meaning cutting up. The term 'dissection' is a Latin equivalent of the Greek *anatome*. However, the two words, anatomy and dissection, are not synonymous. Dissection is a mere technique, whereas anatomy is a wide field of study.

Anatomy forms firm foundation of the whole art of medicine and introduces the student to the greater part of medical terminology. "Anatomy is to physiology as geography is to history, i.e. it describes the theatre in which the action takes place."

SUBDIVISIONS OF ANATOMY

Initially, anatomy was studied mainly by dissection. But the scope of modern anatomy has become very wide because it is now studied by all possible techniques which can enlarge the boundaries of the anatomical knowledge.

The main subdivisions of anatomy are:

1. ***General anatomy:*** Describes various positions, planes of human body, language of anatomy in relation to body parts and movements. It also includes general features of skeleton, joints, muscles, blood vessels, lymphatics, nerves, skin, fasciae, principles of radiography, genetics and brief descriptions of various systems of the body.

2. ***Cadaveric anatomy*** is studied on dead embalmed (preserved) bodies usually with the naked eye (macroscopic or gross anatomy). This can be done by one of the two approaches:
   a. In *regional anatomy* the body is studied in parts, like the upper limb, lower limb, thorax, abdomen, head and neck, and brain (Fig. 1.1).
   b. In *systemic anatomy* the body is studied in systems, like the skeletal system (osteology), muscular system (myology), articulatory system (arthrology or syndesmology), vascular system (angiology), nervous system (neurology), and respiratory, digestive, urogenital and endocrine systems (splanchnology). The locomotor system includes osteology, arthrology and myology. These systems are briefly mentioned close to the end of this chapter.
3. ***Living anatomy*** is studied by inspection (Fig. 1.2a), palpation (Fig. 1.2b), percussion (Fig. 1.2c), auscultation (Fig. 1.2d),

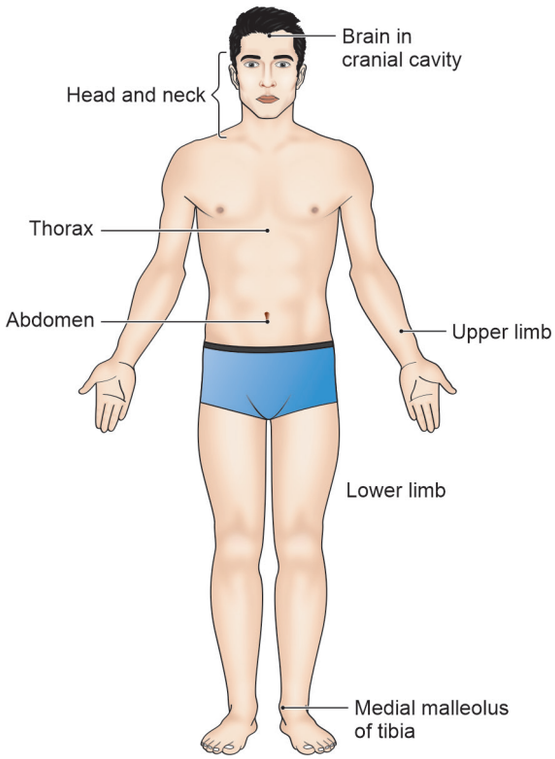


Fig. 1.1: Various regions of the body

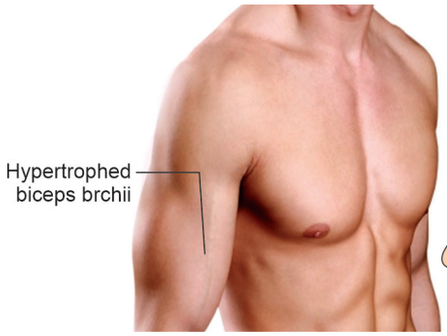


Fig. 1.2a: Inspection of the chest

Fig. 1.2b: Palpation

Fig. 1.2c: Percussion

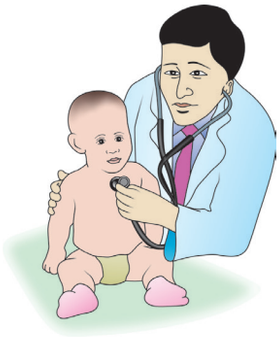


Fig. 1.2d: Auscultation

endoscopy (bronchoscopy, gastroscopy), radiography, electromyography, etc.

4. ***Embryology (developmental anatomy)*** is the study of the prenatal developmental changes in an individual (Fig. 1.3). The developmental history is called 'ontogeny'. The evolutionary history, on the other hand, is called 'phylogeny'.
5. ***Histology (microscopic anatomy)*** is the study of structures with the aid of a microscope (Fig. 1.4).
6. ***Surface anatomy (topographic anatomy)*** is the study of deeper parts of the body in relation to the skin surface, e.g. palpating the artery. It is most important in clinical practice, physical therapy and surgical operations, e.g. palpating the artery (Fig. 1.5).
7. ***Radiographic and imaging anatomy*** is the study of the bones and deeper organs by plain and contrast radiography, by ultrasound and computerised tomographic (CT) scans (Fig. 1.6).

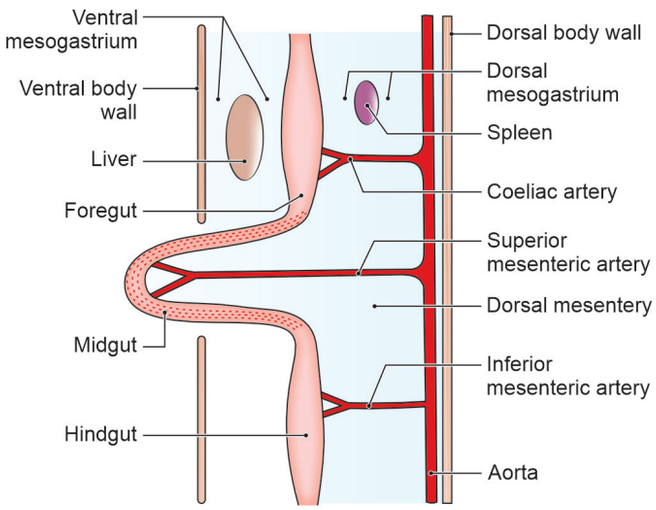
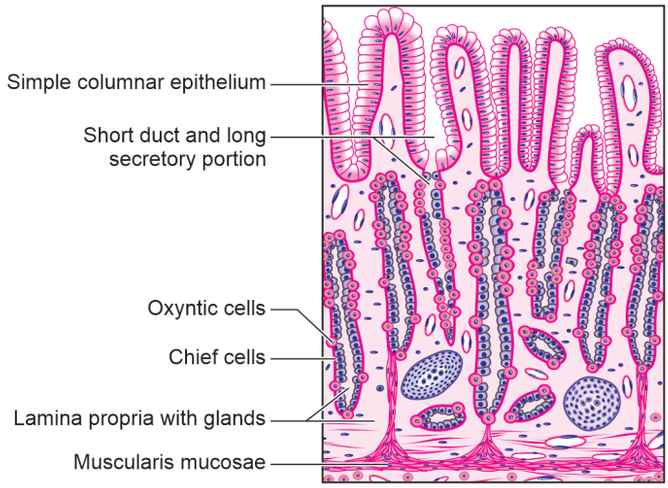


Fig. 1.3: Development of various parts of the gut



- All epithelial cells are simple columnar in type
- Parietal cells are large and pink, chief cells are small and blue
- Duct is 1/3rd, secretory part is 2/3rd

Fig. 1.4: Histology of the mucosa of the fundus of stomach

8. ***Comparative anatomy*** is the study of anatomy of the other animals to explain the changes in form, structure and function (morphology) of different parts of the human body.

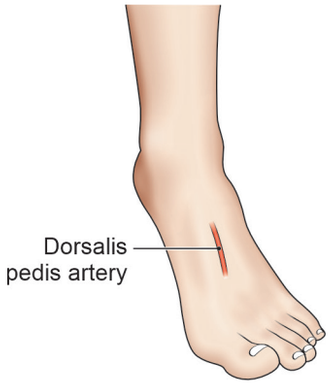


Fig. 1.5: Palpating the dorsalis pedis artery

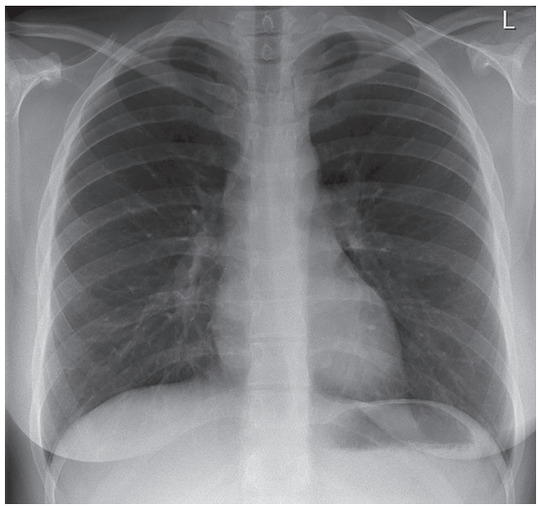


Fig. 1.6: X-ray chest: Posteroanterior view

9. ***Physical anthropology*** deals with the external features and measurements of different races and groups of people, and with the study of the prehistoric remains (Fig. 1.7).
10. ***Applied anatomy (clinical anatomy)*** deals with application of the anatomical knowledge to the medical and surgical practice (Fig. 1.8).
11. ***Experimental anatomy*** is the study of the factors which influence and determine the form, structure and function of different parts of the body.

Fig. 1.7: Physical anthropology

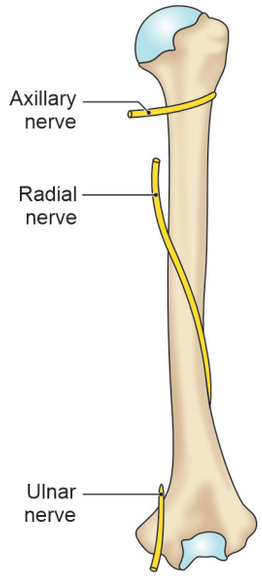


Fig. 1.8: The relation of nerves to the posterior aspect of humerus

12. ***Genetics*** deals with the study of information present in the chromosomes (*see* Chapter 17).

HISTORY OF ANATOMY

1. Greek Period (BC)

Hippocrates of Cos (circa 400 BC), the 'father of medicine', is regarded as one of the founders of anatomy. Parts of Hippocratic collection are the earliest anatomical descriptions.

Herophilus of Chalcedon (circa 300 BC) is called the "father of anatomy". He was a Greek physician, and was one of the first to dissect the human body.

2. Roman Period (AD)

Galen of Pergamum, Asia Minor (circa 130–200 AD), the "prince of physicians", practised medicine at Rome. He was the foremost practitioner of his days and the first experimental physiologist.

3. Fourteenth Century

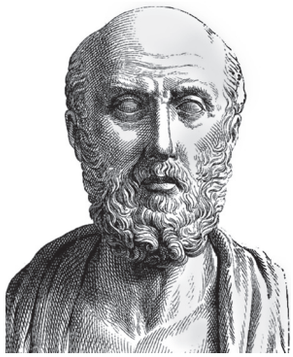
Mundinus or Mondino d'Luzzi (1276–1326), the 'restorer of anatomy', was an Italian anatomist and professor of anatomy at Bologna.

4. Fifteenth Century

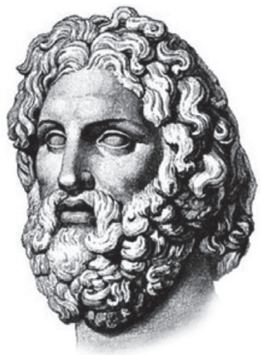
Leonardo da Vinci of Italy (1452–1519), the originator of cross sectional anatomy, was one of the greatest geniuses the world has known. He was the founder of modern anatomy.

5. Sixteenth Century

Vesalius (1514–1564), the 'reformer of anatomy', was German in origin, Belgian (Brussels) by birth, and found an Italian (Padua) university favourable for his work. He was professor of anatomy at Padua.



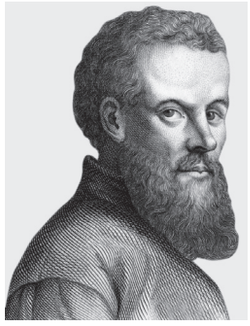
Hippocrates



Herophilus

Galen

Leonardo da Vinci



Vesalius

6. Seventeenth Century

William Harvey (1578–1657) was an English physician who discovered the circulation of blood, and published it as *Anatomical Exercise on the Motion of the Heart* and *Blood* in *Animals*. He also published a book on embryology.

7. Eighteenth Century

William Hunter (1718–1783) was a London anatomist and obstetrician. He introduced the present day embalming with the help of Harvey's discovery, and founded with his younger brother (John Hunter) the famous Hunterian museum.

8. Nineteenth Century

Dissection by medical students was made compulsory in Edinburgh (1826) and Maryland (1833). Burke and Hare scandal of 16 murders took place in Edinburgh in 1828. Warburton Anatomy Act (1832) was passed in England under which the unclaimed bodies were made available for dissection. The 'Act' was passed in America (Massachusetts) in 1831. Formalin was used as a fixative in 1890s.

X-rays were discovered by Roentgen in 1895.

The noted anatomists of this century include Ashley Cooper (1768–1841; British surgeon), Cuvier (1769–1832; French naturalist), Meckel (1724–1774; German anatomist), and Henry Gray (1827–1861; the author of *Gray's Anatomy*).

9. Twentieth Century

The electron microscope was invented in 20th century. It was applied in clinical practice, which made startling changes in the study of normal and diseased conditions.

Besides plain X-rays, in this century, ultrasonography and echocardiography were discovered. These were the non-invasive safe procedure.

Also computer-axial tomography or CT scan, a non-invasive procedure and magnetic resonance imaging were devised.

10. Twenty-first Century

Foetal medicine is emerging as a newer subject. Even treatment *in utero* is being practised in some cases.

Human genome has been prepared.

New research in drugs for many diseases, especially AIDS, is being done very enthusiastically. There is also a strong possibility of gene therapy.

Indian Anatomists

Dr Inderjit Dewan worked chiefly on osteology and anthropology.

Dr DS Choudhry did notable work on carotid body.

Dr H Chaterjee and Dr H Verma researched on embryology.

Dr SS Dayal did good work in cancer biology.

Dr Shamer Singh and his team did pioneering work on teratology.

Dr Chaturvedi's and Dr CD Gupta's prominent work was on corrosion cast.

Dr LV Chako, Dr HN Keswani, Dr Veena Bijlani, Dr Gopinath, Dr Shashi Wadhwa of All India Institute of Medical Sciences, New Delhi, researched on neuroanatomy.

Dr Keswani and his team established museum of history of medicine.

Dr AK Susheela of AIIMS, New Delhi, has done profound work on fluorosis.

Dr MC Vaidya and Dr NK Mehra are well known for their work on leprosy, HLA and immunology.

Dr IB Singh of Rohtak did enlightening studies on histology. He has been author of several books in anatomy.

Dr AK Dutta of West Bengal had authored many books on anatomy. Dr Yogesh Sontakke has been writing many books on anatomy.

Pandit Madhusudan Gupta was the first man who dissected a cadaver in 1836 in Calcutta and created a sensation in orthodox Hindu society. He was honored by a 7 cannon salute.

Dr A Halim was a great teacher of many teachers. He retired from KGMC, Lucknow, UP. His book *Surface and Radiological Anatomy* is most popular.

Dr Chandrama Anand retired as Director of Lady Hardinge Medical College and associated hospitals. She was Director Professor and Head, Department of Anatomy, a very passionate, all-rounder lovable teacher.

Amongst the medical educationists are Dr Sita Achaya, Dr Ved Prakash, Dr Basu, Dr M Kaul, Dr Chandrama Anand, Dr Indira Bahl, Dr Swarna Bhardwaj, Dr Rewa Choudhary, Dr Smita Kakar, Dr Anita Tuli, Dr Shashi Raheja, Dr Ram Prakash, Dr Veena


Dr Madhusudan Gupta


Dr A Halim


Dr Chandrama Anand

Bharihoke, Dr Madhur Gupta, Dr Neelam Vasudeva, Dr Sabita Mishra, Dr Raj Mehra, Dr Rani Kumar, Dr Satyam Khare, Dr JM Kaul, Dr Shipra Paul, Dr Dharamnarayan, Dr AC Das, Dr A Halim, Dr DR Singh and many others.

Dr Harish Agarwal, an anatomist, worked in jurisprudence for a number of years.

Dr Cooper of Chennai, Dr M Thomas and Dr Kiran Kucheria did commendable work on genetics.

Dr Mehdi Hasan and Dr Nafis Ahmad Faruqi did pioneering research in neuroanatomy.

Dr Balasubramanyam is a computer anatomist.

ANATOMICAL NOMENCLATURE

Galen (2nd century) wrote his book in Greek and Vesalius (16th century) did it in Latin. Most of the anatomical terms, therefore, are either in Greek or Latin. By 19th century about 30,000 anatomical terms were in use in the books and journals. In 1895, the German Anatomical Society held a meeting in Basle, and approved a list of about 5000 terms known as **Basle Nomina Anatomica** (BNA). The following six rules were laid down to be followed strictly: (1) Each part shall have only one name; (2) each term shall be in Latin; (3) each term shall be as short and simple as possible; (4) the terms shall be merely memory signs; (5) the related terms shall be similar, e.g. femoral artery, femoral vein, and femoral nerve; and (6) the adjectives shall be arranged as opposites, e.g. major and minor, superior and inferior.

BNA was revised in 1933 by a committee of the Anatomical Society of Great Britain and Ireland in a meeting held at **Birmingham**. The revised BNA was named Birmingham **Revision** (*BR*). An independent revision of the BNA was also done by German anatomists in 1935, and was known as **Jena Nomina Anatomica** (*JNA* or *INA*). However, the *BR* and *INA* found only local and restricted acceptance.

In 1950, it was agreed at an International Congress of Anatomists held at Oxford that a further attempt should be made to establish a generally acceptable international nomenclature. In the Sixth International Congress of Anatomists held at Paris (1955), a somewhat conservative revision of BNA with many terms from BR and INA was approved. Minor revisions and corrections were made at the International Congresses held in New York (1960), and Wiesbaden, Germany (1965), and the 3rd edition of **Nomina Anatomica** (Ed. GAG Mitchell, 1968) was published by the Excerpta Medica Foundation.

The drafts on *Nomina Histologica* and *Nomina Embryologica* prepared by the subcommittee of the International Anatomical Nomenclature Committee (IANC) were approved in a plenary session of the Eleventh International Congress of Anatomists held in Leningrad in 1970. After a critical revision, the 4th edition of *Nomina Anatomica* (Ed. Roger Warwick, 1977) containing *Nomina Histologica* and *Nomina Embryologica* was published by the same publisher.

Competency achievement: The student should be able to:
AN 1.1 Demonstrate normal anatomical position, various planes, relation, comparison, laterality and movement in our body

ANATOMICAL TERMINOLOGY

Various positions, planes, terms in relation to various regions and movements are described.

Positions

- ***Anatomical position:*** When a person is standing straight with eyes looking forwards, both arms by the side of body, palms facing forwards, both feet together, the position is anatomical position (Fig. 1.9).

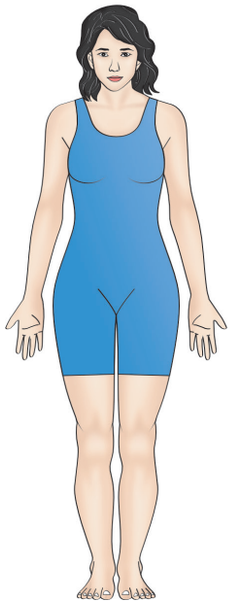


Fig. 1.9: Anatomical position

- ***Supine position:*** When a person is lying on his/her back, arms by the side, palms facing upwards and feet put together, the position is supine position (Fig. 1.10).
- ***Prone position:*** Person lying on his/her face, chest and abdomen is said to be in prone position (Fig. 1.11).
- ***Lithotomy position:*** Person lying on her back with legs up and feet supported in straps. This position is mostly used during delivery of the baby (Fig. 1.12).

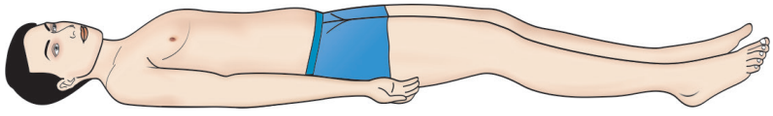


Fig. 1.10: Supine position

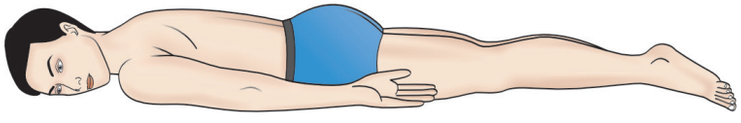


Fig. 1.11: Prone position

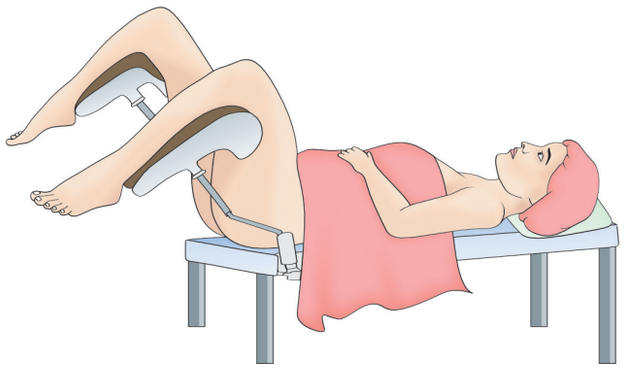


Fig. 1.12: Lithotomy position

Planes

- A plane passing through the centre of the body dividing it into two equal right and left halves, is the median or midsagittal plane (Fig.1.13). Plane parallel to median or midsagittal plane is the sagittal plane.
- A plane at right angles to sagittal or median plane which divides the body into anterior and posterior halves is called a **coronal plane** (Figs 1.14 and 1.15).

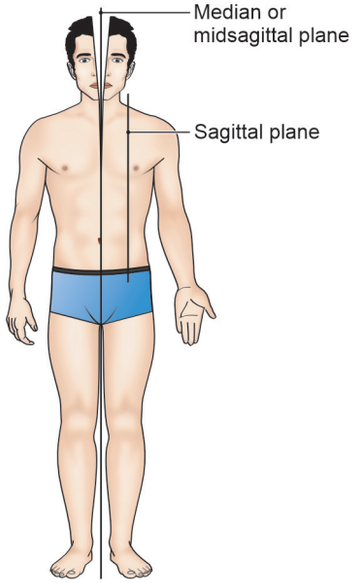


Fig. 1.13: Median and sagittal planes

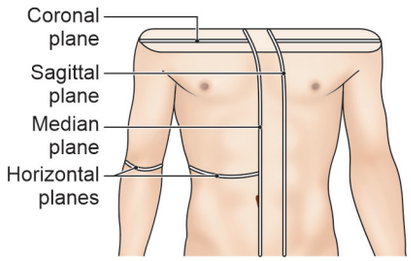


Fig. 1.14: Median, sagittal, coronal and horizontal planes

- A plane at right angles to both sagittal and coronal planes which divides the body into upper and lower parts is called a **transverse horizontal plane** (Fig. 1.15).
- ***Oblique plane:*** Any other plane other than coronal, transverse and midsagittal is called oblique plane.
- ***Cardinal plane:*** If any plane traverses the centre of the body, it is called cardinal plane.

Some other terms:

- ***Fundamental position:*** It is same as anatomical position except that palms are facing the body. It is a comfortable position and is not important from anatomy point of view.
- ***Centre of gravity:*** The point where three cardinal planes intersect in the body is called "centre of gravity".

Terms Used in Relation to Trunk, Neck and Face

- ***Ventral*** or ***anterior*** is the front of trunk, neck and face.
- ***Dorsal*** or ***posterior*** is the back of trunk, neck and face (Fig. 1.17).
- ***Medial*** is a plane close to the median plane (Fig. 1.16).
- ***Lateral*** is plane away from the median plane.
- ***Proximal/cranial/superior*** is close to the head end of body.

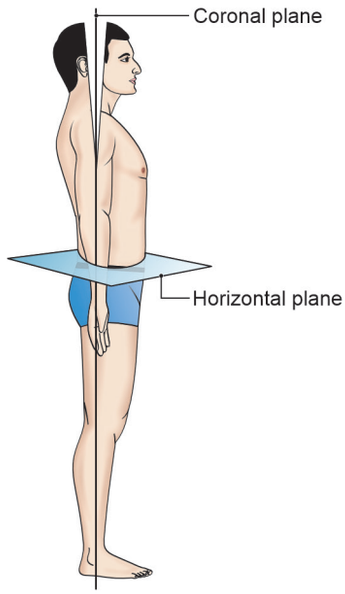


Fig. 1.15: Coronal and horizontal planes

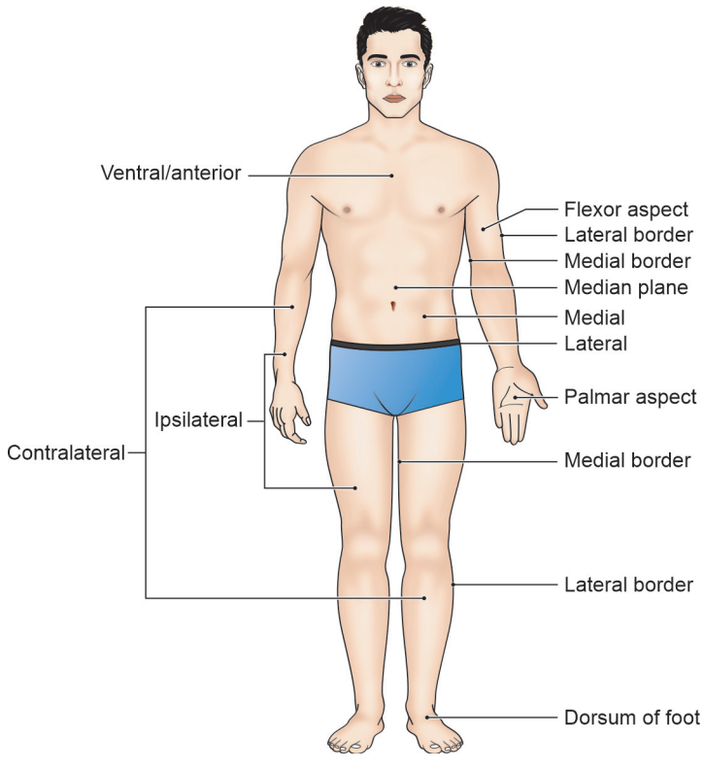


Fig. 1.16: Language of anatomy

- ***Distal/caudal/inferior*** is close to the lower end of the trunk.
- ***Superficial is close to skin/towards*** the surface of body (Fig. 1.18).
- ***Deep*** is away from skin/away from the surface of body.
- ***Ipsilateral*** is on the same side of the body as another structure (Fig. 1.16).
- ***Contralateral*** is on opposite side of body from another structure.
- ***Invagination*** is projection inside.
- ***Evagination*** is projection outside (Fig. 1.19).

Terms Used in Relation to Upper Limb

- ***Ventral*** or ***anterior*** is the front aspect (Fig. 1.17).
- ***Dorsal*** or ***posterior*** is the back aspect.
- ***Medial border*** lies along the little finger, medial border of forearm and arm.
- ***Lateral border*** follows the thumb, lateral border of forearm and arm (Fig. 1.16).

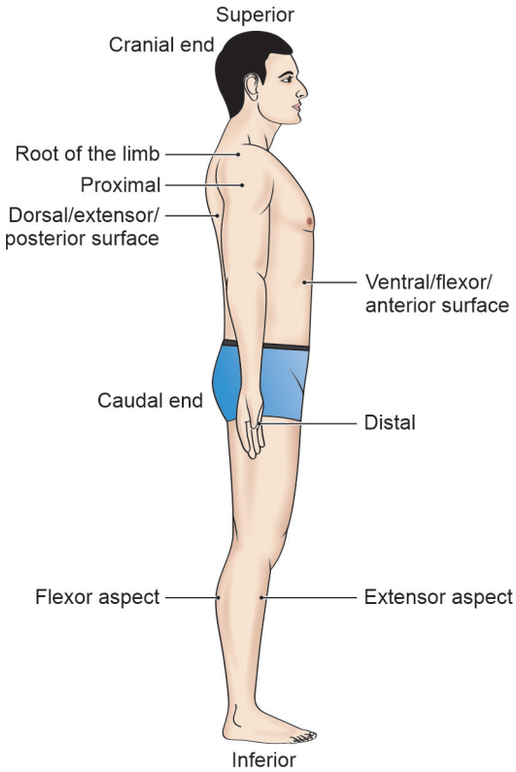


Fig. 1.17: Language of anatomy

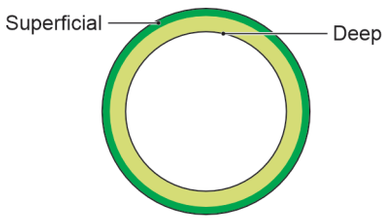


Fig. 1.18: Language of anatomy

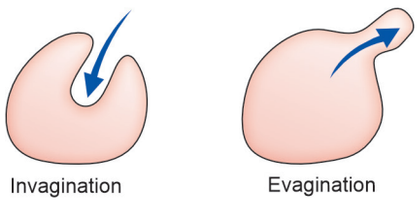


Fig. 1.19: Language of anatomy

- ***Proximal*** is close to root of limb, while ***distal*** is away from the root (Fig. 1.17).
- ***Palmar*** aspect is the front of the palm (Fig. 1.16).
- ***Dorsal*** aspect of hand is on the back of palm.
- ***Flexor*** aspect is front of upper limb.
- ***Extensor*** aspect is back of upper limb.

Terms Used in Relation to Lower Limb

- ***Posterior*** aspect is the back of lower limb.
- ***Anterior*** aspect is front of lower limb.
- ***Medial border*** lies along the big toe or hallux, medial border of leg and thigh (Fig. 1.16).
- ***Lateral border*** lies along the little toe, lateral border of leg and thigh.
- ***Flexor*** aspect is back of lower limb.
- ***Extensor*** aspect is front of lower limb (Fig. 1.17).
- ***Proximal*** is close to the root of limb, while ***distal*** is away from it.

Terms of Relation Commonly Used in Embryology and Comparative Anatomy, but Sometimes in Gross Anatomy

a. ***Ventral***—towards the belly (like anterior).
b. ***Dorsal***—towards the back (like posterior).
c. ***Cranial or rostral***—towards the head (like superior) (Fig. 1.17).
d. ***Caudal***—towards the tail (Fig. 1.17).

TERMS RELATED TO BODY MOVEMENTS

Movements in general at synovial joints are divided into four main categories.

1. ***Gliding movement:*** Relatively flat surfaces move back-and-forth and from side-to-side with respect to one another. The angle between articulating bones does not change significantly.
2. ***Angular movements:*** Angle between articulating bones decreases or increases. In **flexion** there is decrease in angle between articulating bones and in **extension** there is increase in angle between articulating bones (Fig. 1.20). **Lateral flexion** is movement of trunk sideways to the right or left at the waist. **Adduction** is movement of bone toward midline, whereas **abduction** is movement of bone away from midline.
3. ***Special movements:*** These occur only at certain joints, e.g. pronation, supination at radioulnar joints, protraction and retraction at temporomandibular joint, inversion and eversion at subtalar joint.
4. ***Rotation:*** A bone revolves around its own longitudinal axis. In **medial rotation** anterior surface of a bone of limb is turned towards the midline. In **lateral rotation** anterior surface of a bone of limb is turned away from midline.

In Upper limb

Shoulder Joint

- ***Abduction of shoulder:*** When limb is taken away from the body (Fig. 1.21).
- ***Adduction of shoulder:*** When limb is brought close to the body.
- ***Flexion of shoulder:*** If arm is taken towards the front of the chest wall.
- ***Extension:*** Arm is taken backwards and laterally (Fig. 1.22).
- ***Circumduction:*** It is movement of distal end of a part of the body in a circle. A combination of extension, abduction, flexion and adduction in a sequence is called circumduction as in bowling.
- ***Medial rotation of shoulder:*** When the arm rotates medially bringing the flexed forearm across the chest (elbow in contact with trunk).
- ***Lateral rotation of shoulder:*** When arm rotates laterally taking the flexed forearm away from the body (Fig. 1.23) (elbow in contact with trunk).

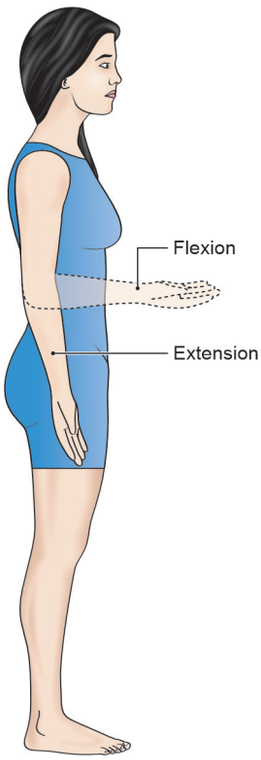


Fig. 1.20: Angular movements

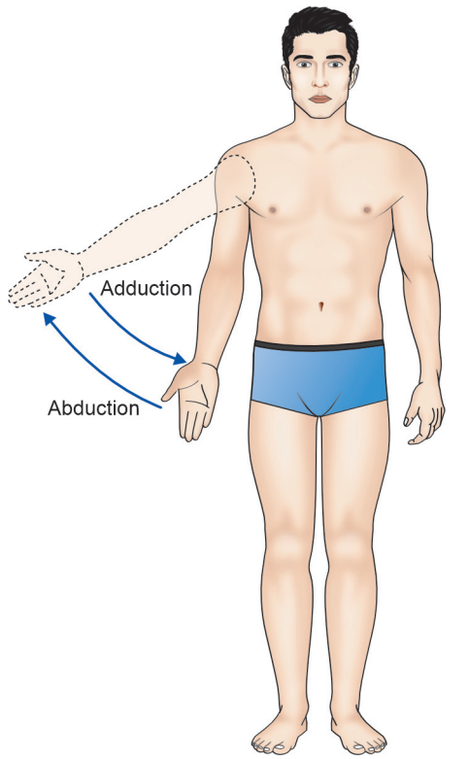


Fig. 1.21: Abduction and adduction of shoulder joint

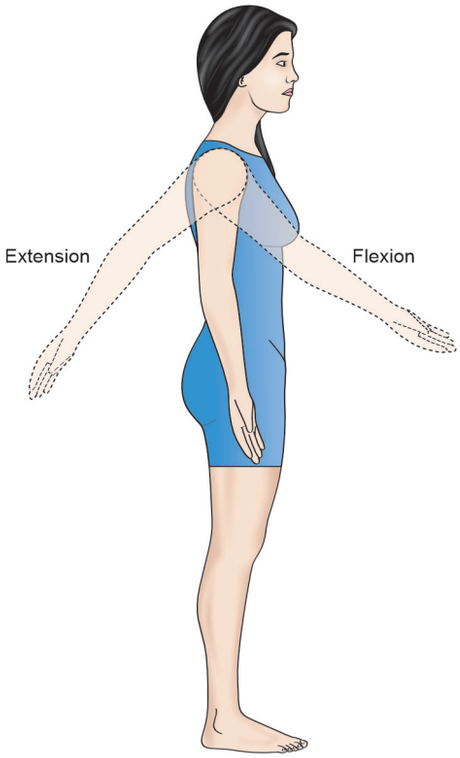


Fig. 1.22: Flexion and extension of shoulder joint

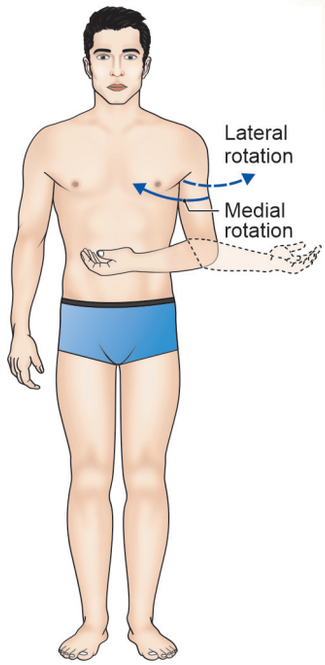


Fig. 1.23: Medial rotation and lateral rotation of shoulder joint

- ***Circumduction:*** When extension, abduction, flexion and adduction are done in sequence.

Elbow Joint

- ***Flexion:*** When two flexor surfaces are brought close to each other, e.g. in elbow joint when front of arm and forearm move close to each other (Fig. 1.20).
- ***Extension:*** When extensor or dorsal surfaces are brought in as much approximation as possible, e.g. straighten the forearm at the elbow joint (Fig. 1.20).

Forearm

- ***Supination:*** Radius and ulna lie parallel to each other (Fig. 1.24). The palm is facing forwards or upwards, putting food in the mouth.

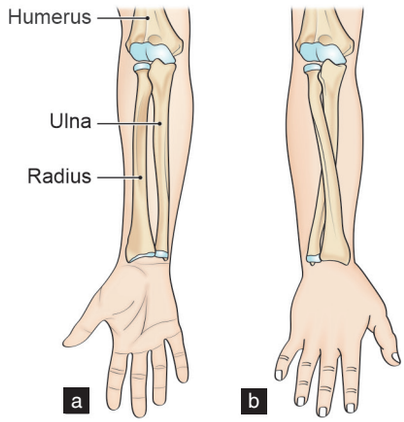


Fig. 1.24: Supinated forearm (a) and pronated forearm (b)

- ***Pronation:*** Radius crosses on back of ulna. The palm faces backwards or downwards, as in picking food with fingers from the plate.

Wrist Joint

- ***Flexion of wrist:*** When palm comes closer to front of forearm (Fig. 1.25).
- ***Extension of wrist:*** When dorsum of hand comes closer to back of forearm (Fig. 1.25).
- ***Adduction of wrist:*** When medial border of palm is turned medially.
- ***Abduction of wrist:*** When lateral border of palm is turned laterally.
- ***Circumduction:*** When above movements are done in sequence.

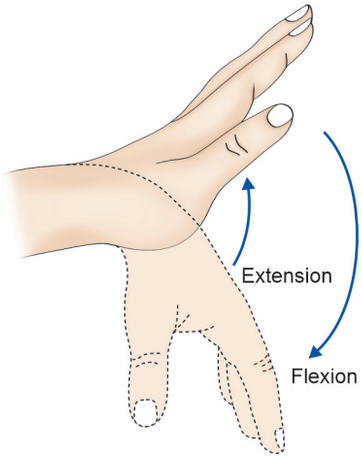


Fig. 1.25: Flexion and extension of wrist joint

Thumb

- ***Opposition of thumb:*** When tip of thumb touches the tips of any of the fingers (Fig. 1.26).
- ***Circumduction of thumb:*** Movement of extension, abduction, flexion and adduction in sequence.
- ***Flexion with medial rotation of thumb:*** When thumb is taken across the palm (Fig. 1.27).

- ***Extension with lateral rotation of thumb:*** When thumb is taken backwards in the plane of the palm (Fig. 1.28).
- ***Abduction of thumb:*** When thumb is put vertically at right angles to plane of the palm (Fig. 1.29).
- ***Adduction of thumb:*** When thumb is in close contact with lateral side of index finger (Fig. 1.30).

Movement of Fingers

The axis of movement of fingers is the line passing through the centre of the middle finger (Fig. 1.31).

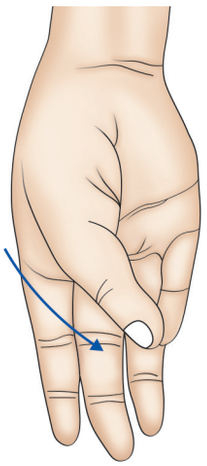


Fig. 1.26: Opposition of thumb

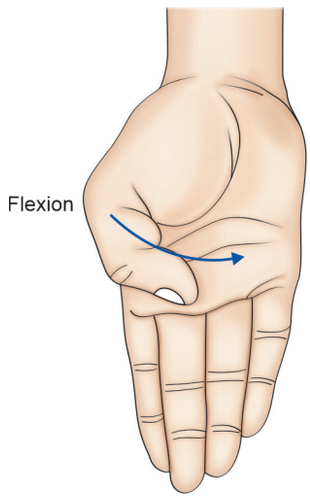


Fig. 1.27: Flexion of thumb

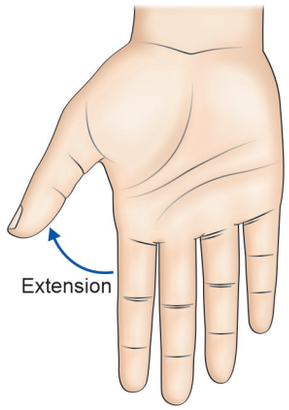


Fig. 1.28: Extension of thumb

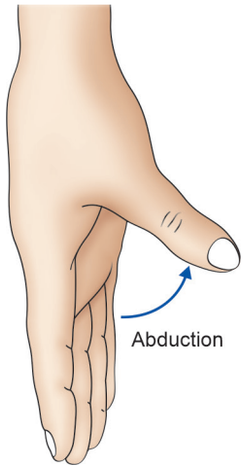


Fig. 1.29: Abduction of thumb

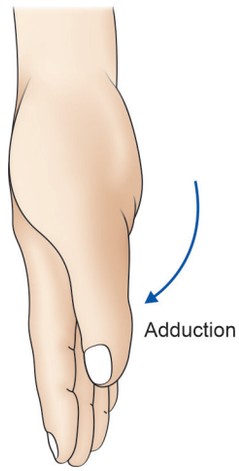


Fig. 1.30: Adduction of thumb

- ***Adduction of digits/fingers:*** When all the fingers get together.
- ***Abduction:*** When all fingers separate (Fig. 1.31).
- ***Flexion of metacarpophalangeal and interphalangeal joints:*** When attempting to make a fist (Fig. 1.32).
- ***Extension of metacarpophalangeal and interphalangeal joints:*** When opening the fist (Fig. 1.32).

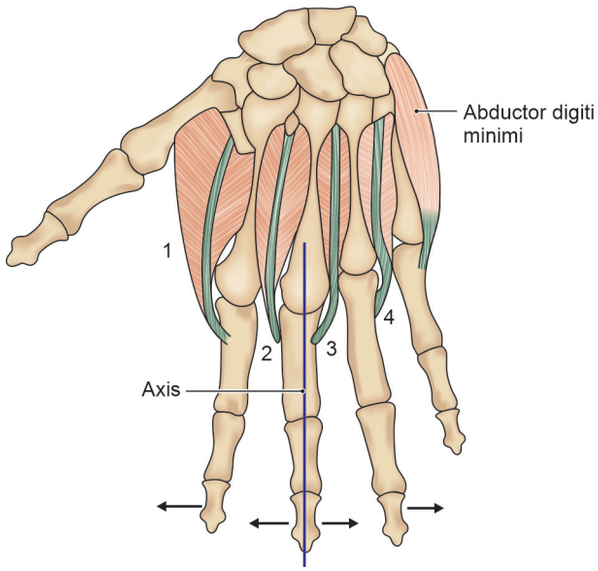


Fig. 1.31: Abduction of 2nd–5th digits; 1, 2, 3, 4 dorsal interossei muscles

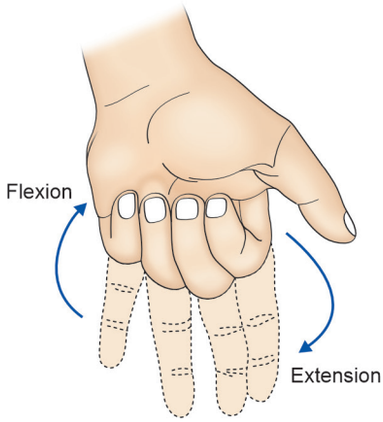


Fig. 1.32: Flexion and extension of metacarpophalangeal and inter-phalangeal joints

In Lower Limb

Hip Joint

- ***Flexion of thigh:*** When front of thigh comes close to or in contact with front of abdomen (Fig. 1.33).
- ***Extension of thigh:*** When person stands erect.
- ***Abduction:*** When thigh is taken away from the median plane.
- ***Adduction:*** When thigh is brought close to median plane.
- ***Medial rotation:*** When thigh is turned medially. It is done by pointing the big toe medially (Fig. 1.34).
- ***Lateral rotation:*** When thigh is turned laterally. It is done by pointing the big toe laterally (Fig. 1.34).
- ***Circumduction:*** When flexion, adduction, extension and abduction are done in sequence (Fig. 1.35).

Knee Joint

- ***Flexion of knee:*** When back of thigh and back of leg come close to or are in opposition (Fig. 1.36).
- ***Extension of knee:*** When thigh and leg are in straight line as in standing (Fig. 1.36).

Ankle Joint

- ***Dorsiflexion of foot:*** When dorsum of foot is brought close to front of leg and sole faces forwards (Fig. 1.37).

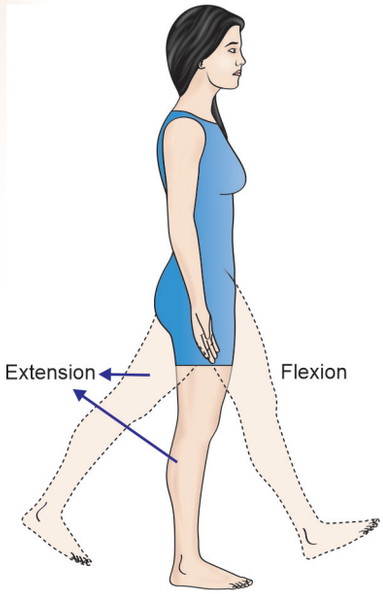


Fig. 1.33: Flexion and extension of thigh

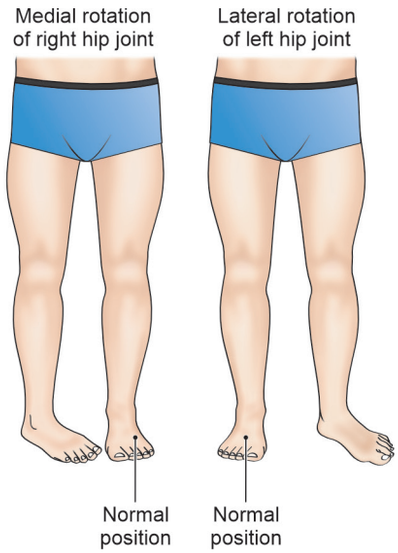


Fig. 1.34: Medial rotation and lateral rotation of thigh

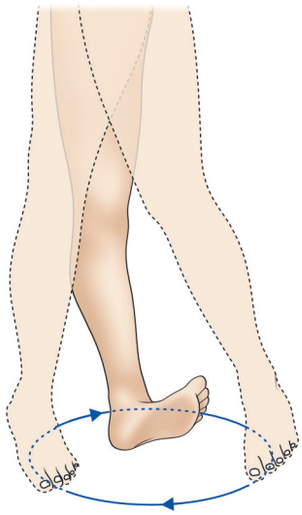


Fig. 1.35: Circumduction of lower limb

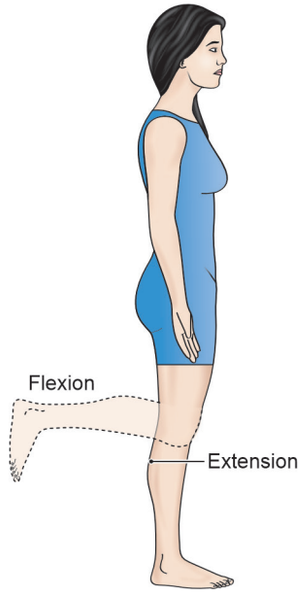


Fig. 1.36: Flexion and extension of knee joint

Fig. 1.37: Dorsiflexion and plantar flexion of foot

- ***Plantar flexion of foot:*** When sole of foot or plantar aspect of foot faces backwards.

Talo-calcaneo-navicular Joint

- ***Inversion of foot:*** When medial border of foot is raised from the ground (Fig. 1.38).
- ***Eversion of foot:*** When lateral border of foot is raised from the ground (Fig. 1.38).

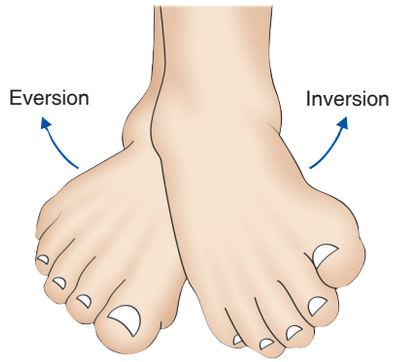


Fig. 1.38: Inversion and eversion of foot

In the Neck

- ***Flexion:*** When face comes closer to chest.
- ***Extension:*** When face is taken away from the chest (Fig. 1.39).
- ***Lateral flexion:*** When ear is brought close to shoulder (Fig. 1.40).
- ***Rotation:*** When neck rotates so that chin goes to opposite side.

Temporo–mandibular Joint

- ***Opening the mouth:*** When lower jaw is lowered to open the mouth (Fig. 1.41).

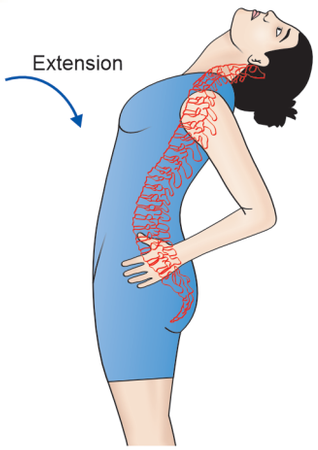


Fig. 1.39: Extension of neck and trunk

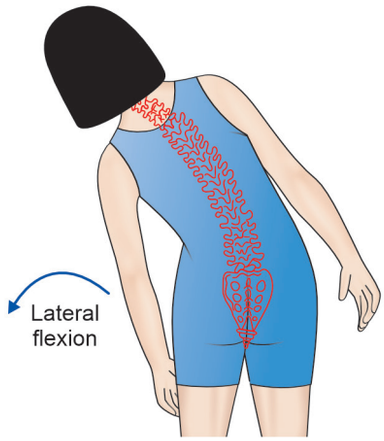


Fig. 1.40: Lateral flexion of neck and trunk

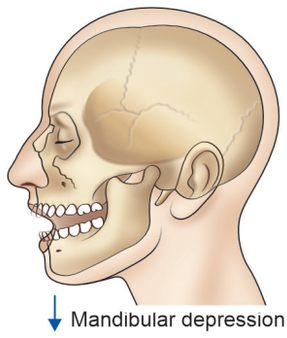


Fig. 1.41: Opening the mouth

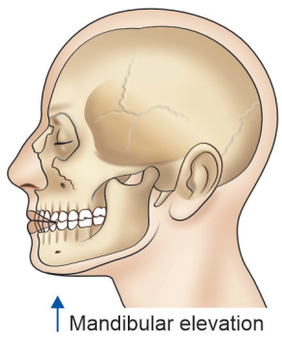


Fig. 1.42: Closing the mouth

- ***Closure of the mouth:*** When lower jaw is opposed to the upper jaw, closing the mouth (Fig. 1.42).
- ***Protraction:*** When lower jaw slides forwards in its socket in the temporal bone of skull (Fig. 1.43).
- ***Retraction:*** When lower jaw slides backwards in its socket in the temporal bone of skull (Fig. 1.44).

In the Trunk

- Backward bending is called ***extension*** (Fig. 1.39).
- Forward bending is ***flexion***.
- Sideward movement is ***lateral flexion*** (Fig. 1.40)
- Sideward rotation is ***lateral rotation***.