
UNIT 1 OSTEOLOGY AND INSTRUMENTS USED

OSTEOLOGY

Practical forms an important component in understanding theory we learn. In this unit let us get familiar with important bones in our body including skull. Osteology is the scientific study of bones and understanding of human skeleton constituting an important part of Physical Anthropology.

Skeleton: The skeleton is a bony and cartilaginous framework of the body. The skeletal framework is found either internally or externally. In some vertebrate animals it is found both internally and externally.

Endoskeleton: The skeleton is located internally in the body.

Exoskeleton: The skeleton is located externally. In human beings the exoskeleton is rudimentary and is represented by nails and enamel of teeth.

Functions of Skeleton

- 1) It constitutes the framework of the body and gives form and shape to the body.
- 2) Forms the central axis of the body.
- 3) Supports and transmits the weight of the body.
- 4) Provides levers essential for locomotion.
- 5) Gives attachments to muscles and ligaments.
- 6) Provides protection to vital organs such as brain, heart and lungs.

The human skeleton consists of 206 bones, and is divided into two major portions- the axial skeleton and the appendicular skeleton (Fig 1.1).

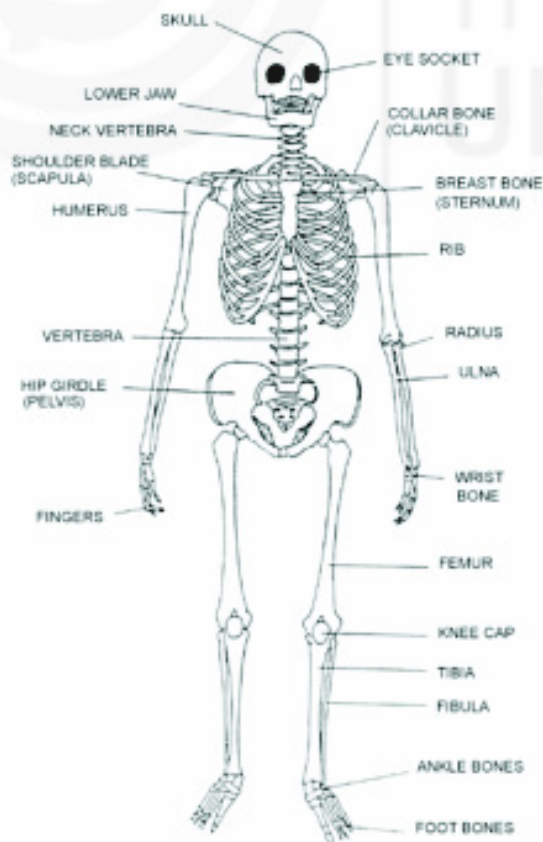


Fig.1.1: Human Skeleton (Anterior View)

Source: 365ayearofdailtasking

Axial skeleton: The axial skeleton consists of the bony and cartilaginous parts. It consists of the 80 bones and it is formed by the Vertebral column (26), the Rib cage (12 pairs of ribs and the sternum), and the Skull (22 bones and 7 associated bones).

Appendicular Skeleton: The appendicular skeleton consists of a total of 126 bones and is formed by the pectoral girdles (4), the upper limbs (60), the pelvic girdle (2), and the lower limbs (60).

The appendicular skeleton is divided into six major regions:

- 1) Pectoral Girdles (4 bones) – Left and right Clavicle (2) and Scapula (2).
- 2) Arm and Forearm (6 bones) – Left and right Humerus (2) (Arm), Ulna (2) and Radius (2) (Fore Arm).
- 3) Hands (58 bones) – Left and right Carpal (16) (wrist), Metacarpal (10), Proximal phalanges (10), Middle phalanges (8), distal phalanges (10), and sesamoid (4).
- 4) Pelvis (2 bones) – Left and right os coxae (2) (ilium).
- 5) Thigh and leg (8 bones) – Femur (2) (thigh), Tibia (2), Patella (2) (knee-cap), and Fibula (2) (leg).
- 6) Feet (56 bones) – Tarsals (14) (ankle), Metatarsals (10), Proximal phalanges (10), middle phalanges (8), distal phalanges (10), and sesamoid (4).

Classification of Bones: There are five types of bones in the body. They are long bones, short bones, flat bones, irregular bones and sesmoid bones.

- 1) **Long bones:** Each long bone has an elongated shaft or diaphysis and two expanded ends (epiphyses) which are smooth and articular. Examples of typical long bones are humerus, radius, ulna, femur, tibia and fibula, metacarpals, metatarsals and phalanges.
- 2) **Short bones:** Short bones are defined as being approximately as wide as they are long and have a primary function of providing support and stability with little movement. Examples: carpal and tarsal bones in the wrist and foot.
- 3) **Flat Bones:** These bones resemble shallow plates and form boundaries of certain body cavities. The example of a flat bone is the scapula, sternum, cranium, pelvis and ribs.
- 4) **Irregular bones:** The bones, which cannot be grouped under any of the above groups, are included in this category. Bones of the vertebral column, sacrum and mandible are the best examples.
- 5) **Sesamoid bones:** These are bony nodules found embedded in the tendons or joint capsules. The patella (knee cap) is a good example.

The following is the brief description of skull, pelvis, long bones (femur, radius, ulna, femur, tibia and fibula), clavicle, scapula and sternum.

Skull: Skull (Fig. 1.2) is the upper most part of the human skeleton consisting of head and face. The human skull usually consists of 22 bones. Except for the mandible (lower jaw), all of the bones of the skull are connected together by

sutures. The skeleton of a skull without mandible is called Cranium which is made up of with 8 bones and thirteen bones form the facial skeleton. The mandible is a movable bone held to the cranium by ligaments.

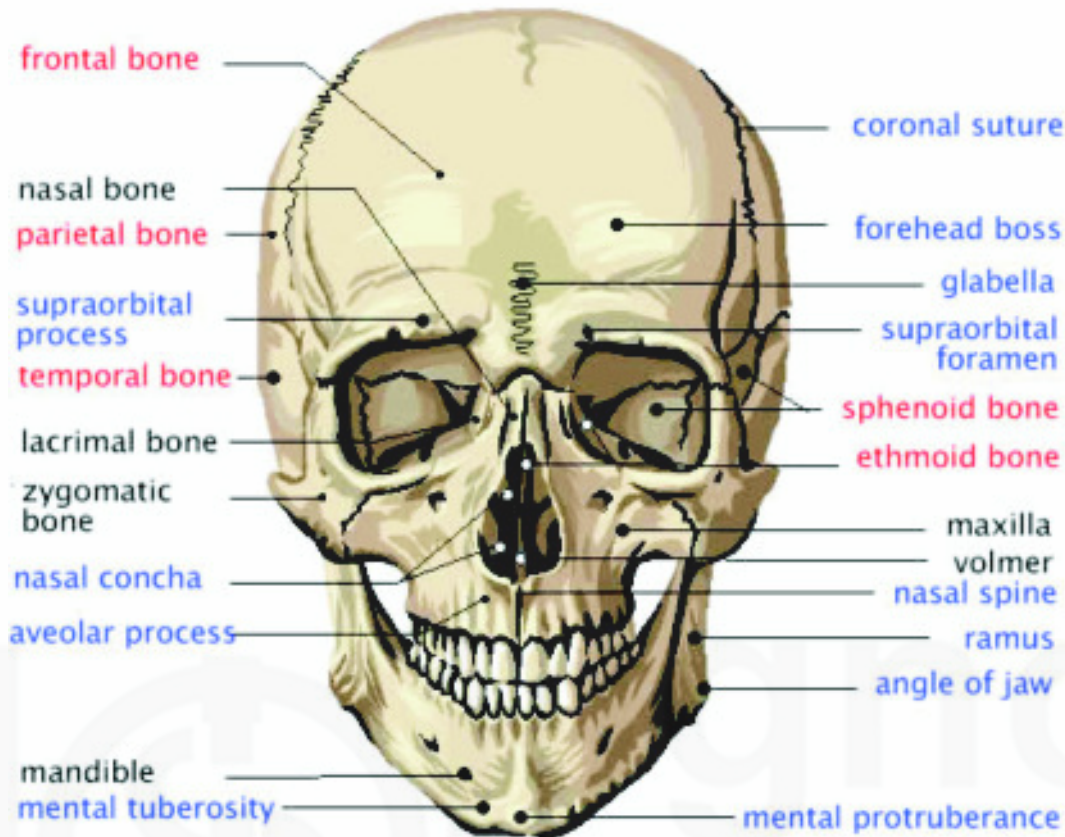


Fig.1.2: Skull (Anterior view)
Source: face-and-emotion.com

The cranial bones can be divided into two categories: the calvaria and the cranial base. The calvaria is the dome-shaped superior portion of the cranium. It is composed of the frontal, occipital, and parietal bones, and the flat portion of the temporal bones. The cranial base is composed of the two remaining cranial bones, the ethmoid and the sphenoid bone. Fourteen facial bones form the other components of the skull. The facial bones are composed of the inferior nasal conchae, lacrimal bones, mandible, maxillary bones, nasal bones, palatine bones, vomer and zygomatic bones.

Let us get familiar with the description of the bones of the Cranium and Facial skeleton.

Cranium

Eight bones constitute the cranium. The eight bones are, frontal (1), parietal (2), occipital (1), temporal (2), sphenoid (1) and ethmoid (1).

Frontal bone: The frontal bone forms the anterior part of the skull above the eyes. On the upper margin of each orbit, the frontal bone is marked by a supraorbital foramen and or supraorbital notch.

Parietal bones: The two parietal bones jointly constitute upper part of the lateral wall of the cranium. One parietal bone is located on each side of the skull, just behind the frontal bone. Both the parietal bones jointly form the bulging sides and roof of the cranium.

Occipital bone: This bone forms the back of the skull and the base of the cranium. The lambdoidal suture connects the occipital bone and the parietal bones. There is a large opening on its lower surface called the foramen magnum. Occipital condyles, which are rounded processes are located on each side of the foramen magnum, articulate with the atlas (first vertebra) of the vertebral column.

Temporal bone: On each side of the skull the temporal bone joins the parietal bone along a squamosal suture. Parts of the sides and the base of the cranium are formed by the temporal bones. The external auditory meatus, is an opening which is located near the inferior margin and leads to inward parts of the ear. We find there are two projections-a rounded mastoid process and a long, pointed styloid process under the external auditory meatus. A zygomatic process projects anteriorly from the temporal bone and joins the zygomatic bone.

Sphenoid bone: On the anterior portion of the cranium this sphenoid bone is wedged between numerous other bones. It consists of a central part and two greater and two lesser wings. The base of the cranium, sides of the skull and floors and sides of the orbits are formed by the sphenoid bone. A portion of the sphenoid bone rises up and forms a saddle shaped mass called the *sella turcica*.

Ethmoid bone: The ethmoid bone is cubical in shape and is very light. It is situated at the anterior part of the base of the cranium and contributes in forming the medial walls of the orbits, the septum of the nose, and roof and lateral walls of the nasal cavity.

Facial Skeleton

The facial skeleton consists of fourteen bones of which thirteen are immovable, the lower jaw being a movable bone. These bones include, Maxilla (2), Zygomatic (2), Lacrimal (2), Nasal (2), Inferior nasal conchae (2), Palatine (2), Vomer (1) and Mandible (1).

Maxillary bones: The upper jaw is formed by the maxillary bones. The inferior border of each maxillary bone projects downward forming an alveolar process. These processes together form a horseshoe-shaped alveolar arch. The anterior roof of the mouth, floor of the orbits, and sides and floor of the nasal cavity comprise the portions of maxillary bones. These bones also contain the sockets of the upper teeth. Lateral to the nasal cavity, inside the maxillae are maxillary sinuses, which are the largest of the sinuses. In course of development to form the anterior section of the hard palate, portions of the maxillae (palatine processes), grow together and fuse along the midline. The alveolar process is formed by the inferior border of each maxillary bone which is projecting downwards. Together these processes forms a horseshoe shaped alveolar arch.

Zygomatic bones: The prominences of the cheeks below and to the sides of the eyes are formed by these zygomatic bones. In the formation the lateral walls and floors of the orbits the zygomatic bones helps a lot. Each of these zygomatic bones has a temporal process, which extend posteriorly to unite the zygomatic process of a temporal bone. Jointly these two processes (temporal process, zygomatic process) form a zygomatic arch.

Lacrimal bones: The lacrimal bone is situated in the medial wall of each orbit between the ethmoid bone and maxilla.

Nasal bones: These nasal bones lie side by side and are fused at the midline and form the bridge of the nose. The nasal bones are long, thin and almost rectangular.

Inferior nasal conchae: These bones are scroll-shaped, delicate and attached to the lateral walls of the nasal cavity. The inferior conchae, provide support for mucous membranes within the nasal cavity like that of the superior and middle conchae.

Palatine bones: Each bone is more or less L-shaped. These palatine bones are situated at the back the maxillae. The horizontal portions serve as both the posterior section of the hard palate and the floor of the nasal cavity. The lateral walls of the nasal cavity are formed by the perpendicular portions of the palatine bones.

Vomer: Vomer is located in the midsagittal line. This bone articulates with the sphenoid and the ethmoid bones and the left and right palatine bones. It also articulates with the left and right maxillary bones.

Mandible: The mandible is a movable bone held to the cranium by ligaments and consists of a horizontal, horseshoe-shaped body with a flat portion projecting upward at each end.

These two processes called an anterior coronoid process and the other is a posterior mandibular condyle. The coronoid processes serve as attachments for muscles used in chewing where as the mandibular condyles articulate with the mandibular fossae of the temporal bones. The other large chewing muscles are inserted on the lateral surface of the mandible. The alveolar arch that contain the hollow sockets bear the lower teeth.

Morphologically, the human skull can be studied in five different views

- Norma verticalis - Superior view
- Norma basalis - Inferior view
- Norma frontalis - Anterior view
- Norma Occipitalis - Posterior view
- Norma Lateralis - Lateral view

Norma Verticalis (Fig 1.3 and 1.4): The general contour of the cranium, the nature and the eminences as well as the nature of the sutures can be better understood by studying cranium in this view. In this view some skulls are oval while some appear circular in shape. In this view portions of frontal, two parietal and occipital bones, and also three sutures namely the coronal sutures, the sagittal suture and lambdoid sutures are seen. The point of junction of the sagittal suture with the coronal sutures is termed the bregma and that of the sagittal and lambdoid sutures is termed the lambda. The landmarks like coronale, bregma, euryon, and opisthocranium are seen in this view.

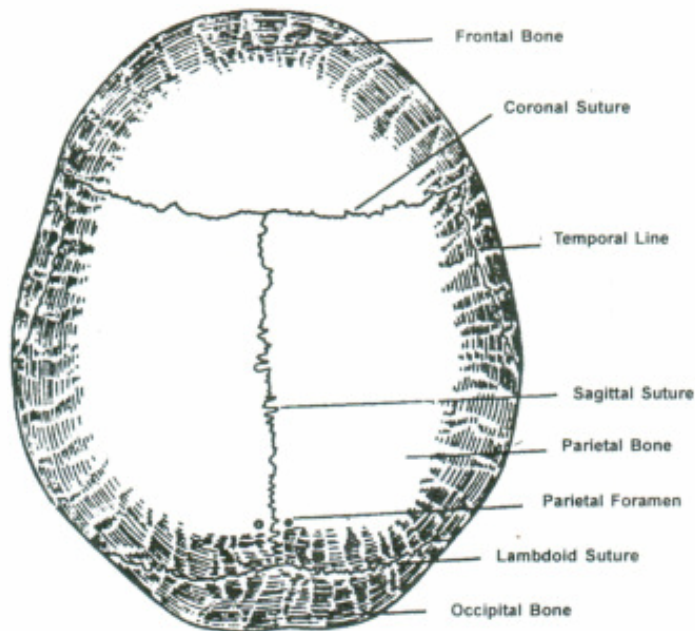


Fig.1.3: Norma Verticalis

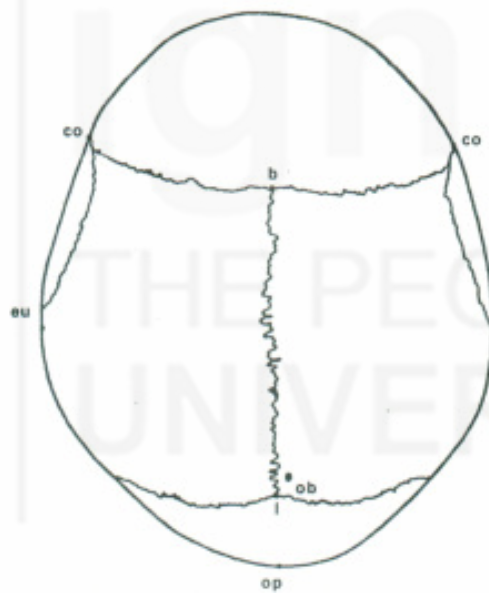


Fig.1.4: Norma Verticalis with landmarks

Norma Frontalis (Fig. 1.5 and 1.6): In this view, the skull exhibits somewhat oval outline, wider above than below and limited above by the frontal bone, zygomatic bone and the mandibular rami on the lateral side and mandible on the lower side. The skull in this view is divided into two major parts, the upper and lower. The upper part is mostly formed by the frontal bone, and the lower part which is made up of the bones of the face is irregular with two orbits and the anterior bony aperture of the nose. The lateral margins and the lower border of the facial part are formed by the Mandible.

The following is the brief account on the upper and lower parts.

Upper part: The curved elevations of the frontal bone known as supraorbital ridges, just above the orbits joined to one another in the middle by the glabella. The nasal bones meet the frontal bone in the fronto-nasal suture, which is below the glabellae and the mid point of it is termed as nasion. The two rounded eminences

above the supraorbital ridges one on either side are known as frontal eminences. Parts of parietal, temporal and sphenoid wings are seen in this upper part.

Lower Part: When we observe the skull from the lower part, the orbits are quadrangular in shape. The upper margins of orbits are entirely formed by the frontal bone, and the lateral margins are formed by the zygomatic process of the frontal bone above, and by the frontal process of the zygomatic bone, below. The infraorbital margins are formed medially by the maxillae and laterally by the zygomatic bone. Between the maxillae and below the nasal bones is seen the pyriform aperture. This pyriform aperture is surrounded by pointed margins and to this the lateral and alar cartilages of the nose are attached. Viewing of the skull in norma frontalis, the mandible exhibits mainly the alveolar margin, chin region and the mental foramina. The gonion is the lateral most and inferior point on angle of the jaw.

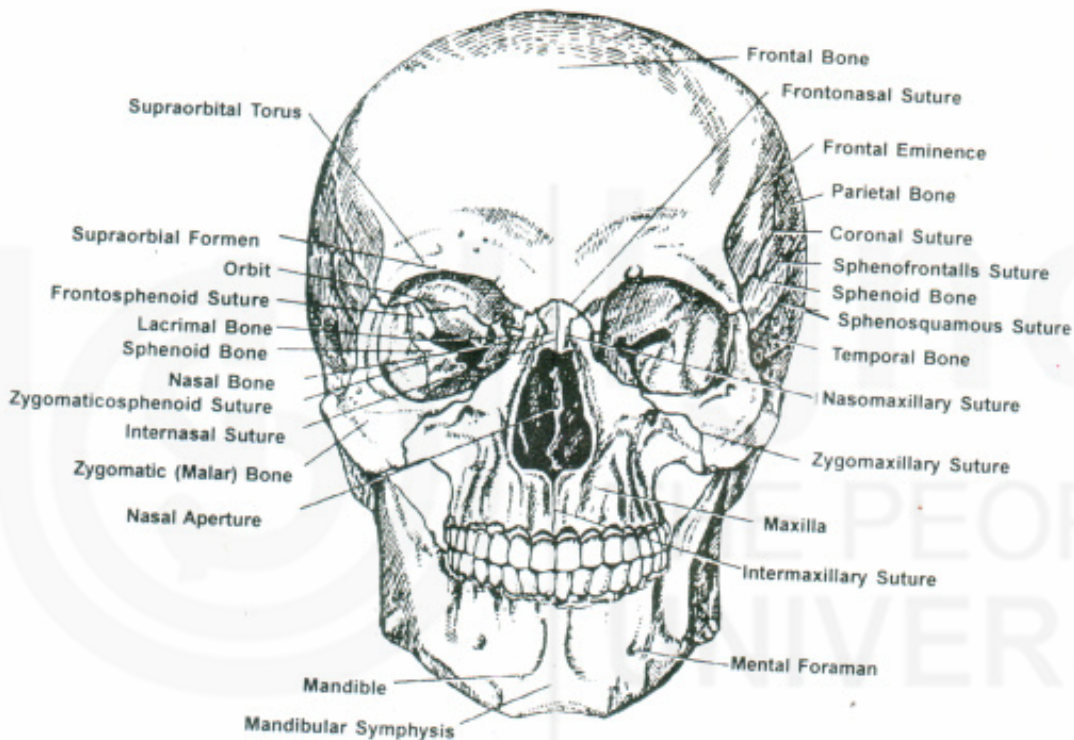


Fig.1.5: Norma Frontalis

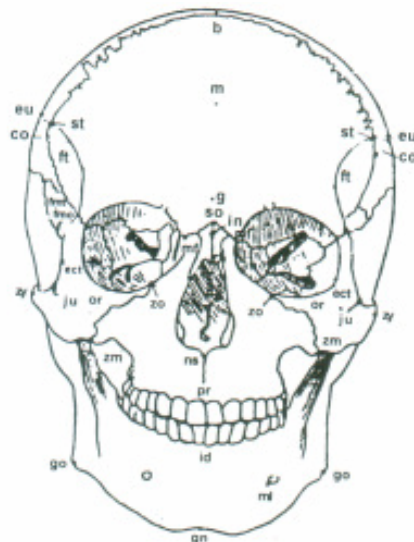


Fig.1.6: Norma frontalis with land marks

Norma Basalis (Fig. 1.7 and 1.8): When we view the skull in this position from the external surface, (excluding the mandible) it is surrounded by the incisor teeth in front; by the superior nuchal lines of the occipital behind; and by the alveolar arch laterally. In this position palatine processes of the maxillæ and palatine bones, the pterygoid processes, the vomer, spinous processes, and parts of sphenoid, the surfaces of the squamæ and mastoid and petrous portions of the temporals, and the surface of the occipital bone, are found. The hard palate forms the *anterior* part where as the *middle* and *posterior* parts are formed by a transverse line drawn through the anterior margin of the foramen magnum. The surface of the skull in this norma is very irregular and is separated into anterior, middle and posterior portions.

On the anterior part of norma basalis, both antero-posteriorly and transversely, the palate is arched. The palatine vault is greatest in the region of the molar teeth with respect to the depth and breadth. The maxillae and the horizontal plates of the palatine bones form the bony plate of the palatine process. These are divided from one another by a cruciform suture, made up the intermaxillary, interpalatine and palatomaxillary sutures. On the middle part of this norma, the pterygoid process of the sphenoid bone descends behind the third molar from the junction of its greater wing and the body. The medial pterygoid plate is narrower of the two and projects directly backwards. The posterior border of the vomer separates the two posterior nasal apertures in the medial plane anteriorly. The tympanic piece of the temporal bone separates the articular fossa from the external auditory meatus. On the posterior part of the norma basalis, the foramen magnum of the occipital bone occupies the anterior part. The antero-posterior distance is greater than the transverse and it is in oval shape. On each side by the occipital condyles, the margin of the foramen is slightly interrupted on anterior side and it projects downwards to articulate with the atlas. There lies a jugular foramen between the occipital bone and the jugular fossa. The external occipital crest is seen on the squamous part of the occipital bone on the median plane behind the foramen magnum.

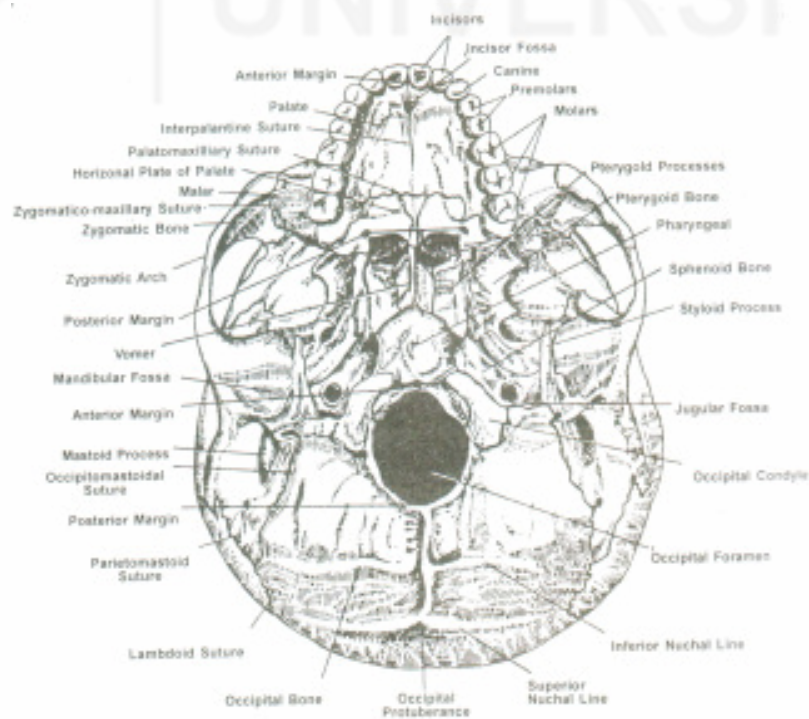


Fig.1.7: Norma Basialis

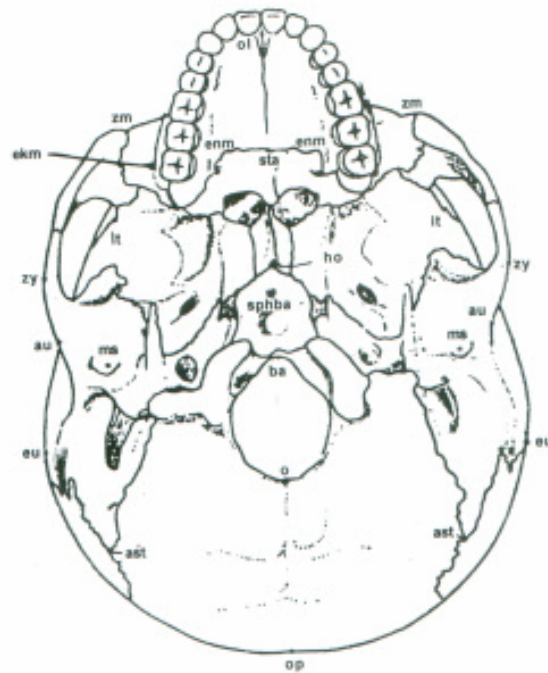


Fig.1.8: Norma Basialis with Land marks

Norma Lateralis (Fig. 1.9 and 1.10) : In this view the skull consists of the cranium above and behind, and of the face below and in front. The cranium is rather ovoid in shape. The contour varies from cases and depends largely on the length and height of the skull. In this view seen are the frontal, the parietal, the occipital, the temporal, and the greater wing of the sphenoid bone.

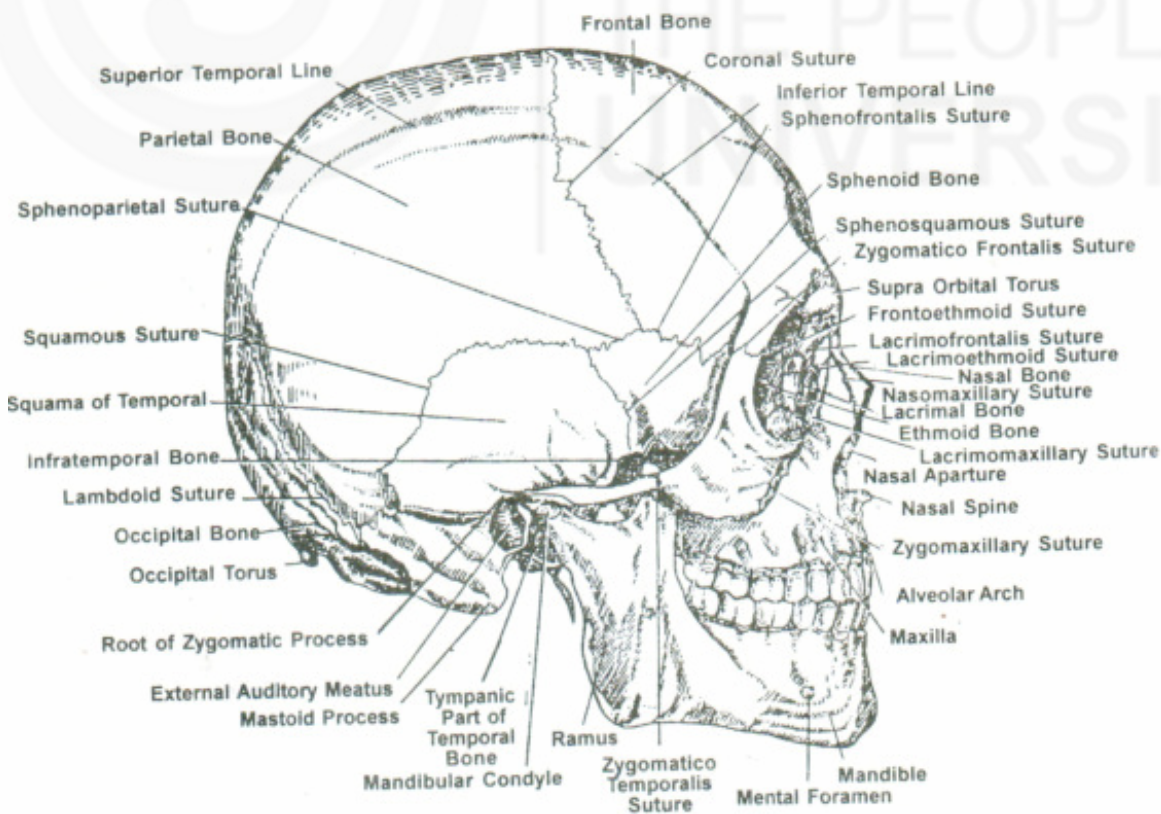


Fig.1.9: Norma Lateralis

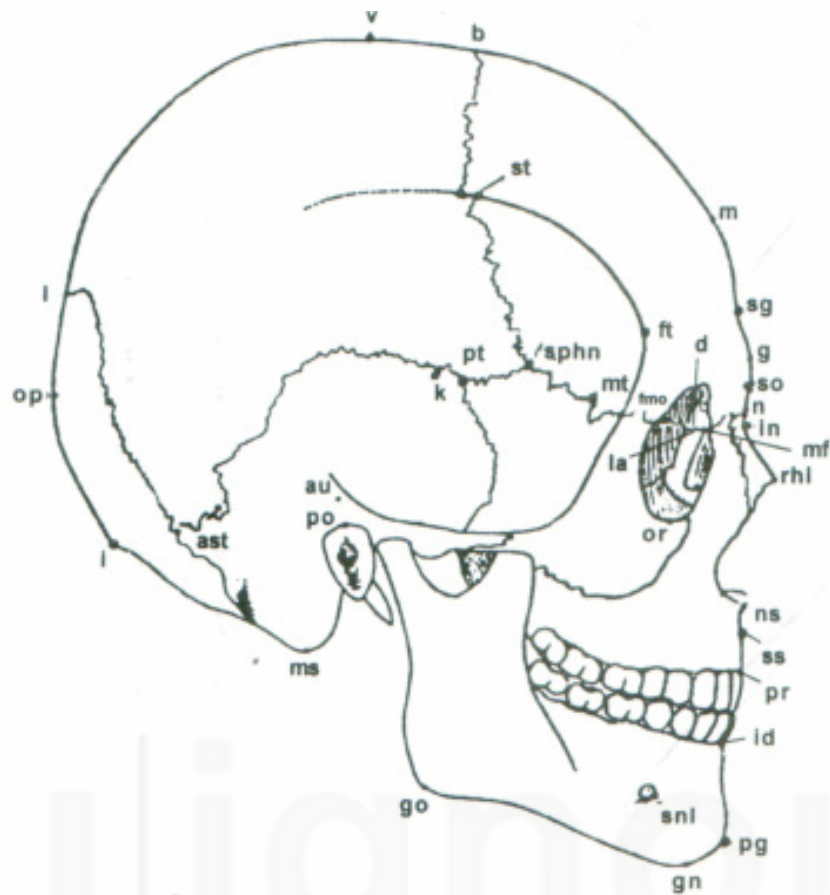


Fig.1.10: Norma Lateralis with Land marks

The frontal process of the zygomatic bone and the temporal line is called the temporal fossa. The bottom of the temporal fossa gives origin to the temporalis muscle and it in turn controls the movements of the mandible. The temporal process of the zygomatic bone and the zygomatic process of the temporal bone forms the zygomatic arch. The glenoid fossa is formed by the zygomatic process of the temporal bone (the zygoma), which widens posteriorly as it approaches the squamous part which is divided into an anterior and posterior root which form the respective borders of the articular fossa. The posterior part of the posterior root of the zygoma open by the external auditory meatus. The external meatus is formed by the tympanic plate of the temporal bone from the anterior, inferior and the lower part of the posterior margin. The mastoid process articulates with the parietal bone in parietomastoid suture and it articulates posteriorly with the occipital bone in occipitomastoid suture. In this view of the cranium the parts like, the alveolar margin, the mental protuberance, the condyloid process, part of the coronoid process, the sigmoid notch, the body of the mandible are seen.

Norma Occipitalis (Fig. 1.11 and 1.12) In this position the cranium is more or less circular outline. The two mastoid processes forms the base of the arch. External occipital protuberance is seen in this norma and this is situated on the lower part of the field in the median plane with the ridges leading out from it. Passing laterally from the protuberance, the superior nuchal lines are the distinct ridges which form the boundary lines between the scalp and the back of neck. The land mark 'inion' is observed prominently on the external occipital protuberance.

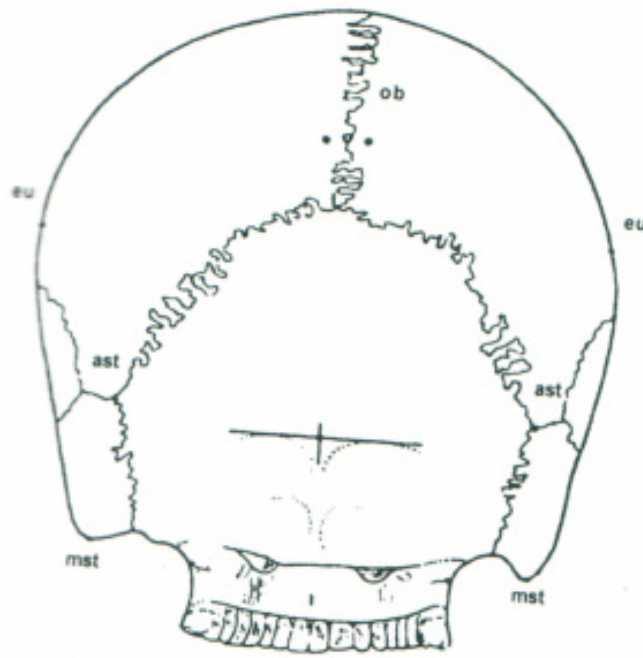


Fig. 1.11: Norma Occipitalis with Land marks

Pelvis

The pelvis (Fig. 1.12), lies between the segments of the vertebral column and the lower limbs and looks like a basin. Pelvis consists of four bones: the two hip bones laterally and in front and the sacrum and coccyx behind. The pelvis is divided into a greater (false) pelvis and lesser (true) pelvis. The expanded portion of the cavity above the pelvic inlet which is bound on each side by the ilium and behind by the base of the sacrum is the greater pelvis. The pelvic cavity which is located below and behind the pelvic brim forms the true pelvis. The true pelvis possesses an inlet, outlet, and a cavity.

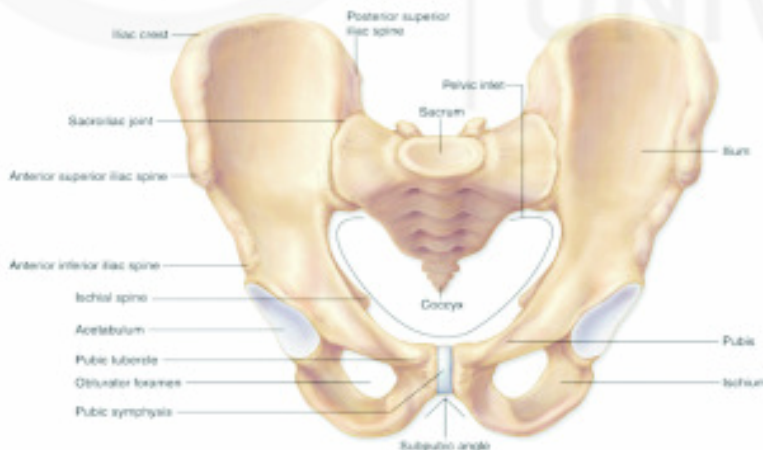


Fig.1.12: Pelvis

Source: graphicshunt.com

The boundaries of the inlet constitute brim of the pelvis and it is heart shaped. It consists of three main diameters: antero-posterior which is extending from the lumbosacral angle to the symphysis pubis; transverse and which is extending from the iliopubic eminence to the opposite sacroiliac joint. The outlet is bound behind by the apex of the coccyx and laterally by the ischial tuberosities and it is

irregular in shape. The antero-posterior diameter of the outlet is extended from the apex of the coccyx to the lower part of the symphysis pubis. The transverse diameter of the outlet is extended between the broadest parts of the lateral walls. The cavity is a short and curved canal considerably deeper behind than in front.

Hip bone: This is the large bone of the pelvis and is irregular in shape. Each hip bone develops from three parts, an ilium, an ischium, and a pubis. These three parts fuse in the walls of the acetabulum. This depression is on the lateral surface of the hipbone, and it receives the rounded head of the femur. The ilium includes the upper part of the acetabulum and the ischium includes the lower part of the acetabulum. The two partner hip bones articulate anteriorly at the symphysis pubis. A portion of each pubis passes posteriorly and downward to join ischium. On either side of these bones and between the bodies we find a large opening. This is called the obturator foramen. The obturator foramen is the largest foramen in the skeleton.

Pectoral Girdle

The pectoral girdle, also call it as shoulder girdle consists of the clavicle and scapula in humans. We find on the dorsal (posterior) part two scapula and on the anterior (ventral) part two clavicles.

Scapula: Scapula is a flat, triangular bone, with two surfaces (dorsal and costal), three borders (superior, lateral and medial) and three angles (inferior, superior and lateral). We find scapula on the posterior part of the pectoral girdle. The dorsal surface of each scapula is divided into unequal portions by a spine. This spine leads to two processes, an acromion process, which forms the tip of the shoulder, and a coracoid process, which curves forward and downward below the clavicle. The acromion process articulates with the clavicle. The acromian and the coracoid process also provides attachments for arm and chest muscles. Between the acromion and coracoid processes there is a depression called the glenoid cavity. This cavity articulates with the head of the humerus.

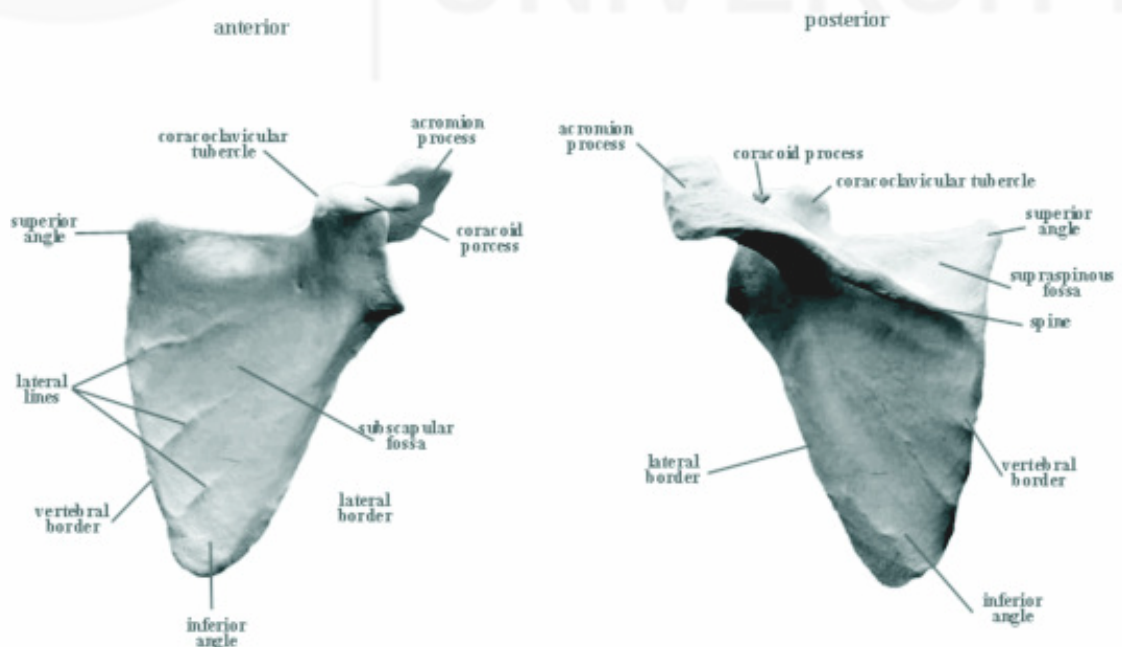


Fig. 1.13: Scapula

Source: reel.utsc.utoronto.ca

Clavicle: It is a long, curved bone which forms the anterior part of the pectoral girdle. It is a slender, rodlike bone with elongated S-shape. It is located at the base of the neck and run horizontally between the manubrium and scapula. The clavicle has two ends (sternal and acromial), two borders (anterior and posterior), and four surfaces (anterior, posterior, upper and inferior). The lateral, or acromial end is flattened and articulates with the acromion of the scapula.

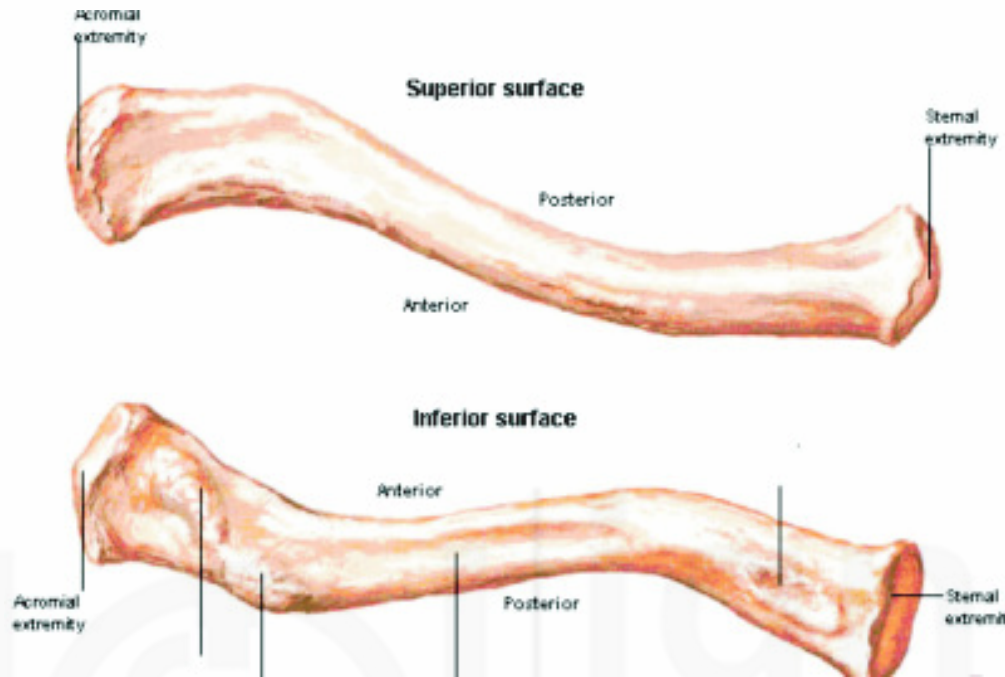


Fig.1.14: Clavicle

Source: blissfullyaesthetic.bl...

Sternum: The sternum or breastbone is located along the midline in the anterior portion of the thoracic cage. The sternum from the upper end supports the clavicle, and its margins articulate with the cartilage of the first seven pairs of ribs. Sternum is a flat, elongated bone that consists of three parts, an upper manubrium, a middle body and a lower xiphoid process, which projects downwards. The manubrium articulates with the clavicles by facets on its superior borders.

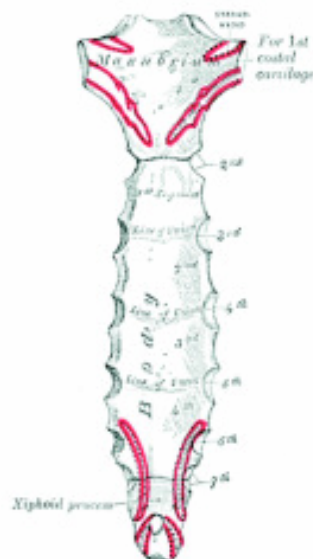


Fig.1.15: Sternum

Source: learnbones.com

Limbs: Human skeleton consists of upper limbs and lower limbs. The arm, wrist, palm and fingers form the upper limbs. The arm is divided into upper arm and forearm. The upper arm contains a single bone the humerus, the forearm with two bones, radius and ulna and the wrist, palm and fingers contain carpals, metacarpals and phalanges. The bones of the lower limb form the framework of the leg, ankle, foot and toes. The bones of the lower limb include femur, tibia, fibula, tarsals, metatarsals and phalanges.

Humerus: The humerus is a heavy and longest bone that extends from the scapula to the elbow. It has a cylindrical shaft and two (upper and lower) extremities. The upper extremity has a smooth rounded head that fits into the glenoid cavity of the scapula. Just below the head, there are two processes- a greater tubercle on the lateral side and a lesser tubercle on the anterior side. The lower extremity consists, anteriorly the two smooth condyles (a lateral capitulum and a medial trochlea), and two fossae- lateral (radial) and medial (coronoid); and posteriorly, the olecranon fossa which lodges the olecranon process of ulna. The capitulum articulates with the head of the radius.

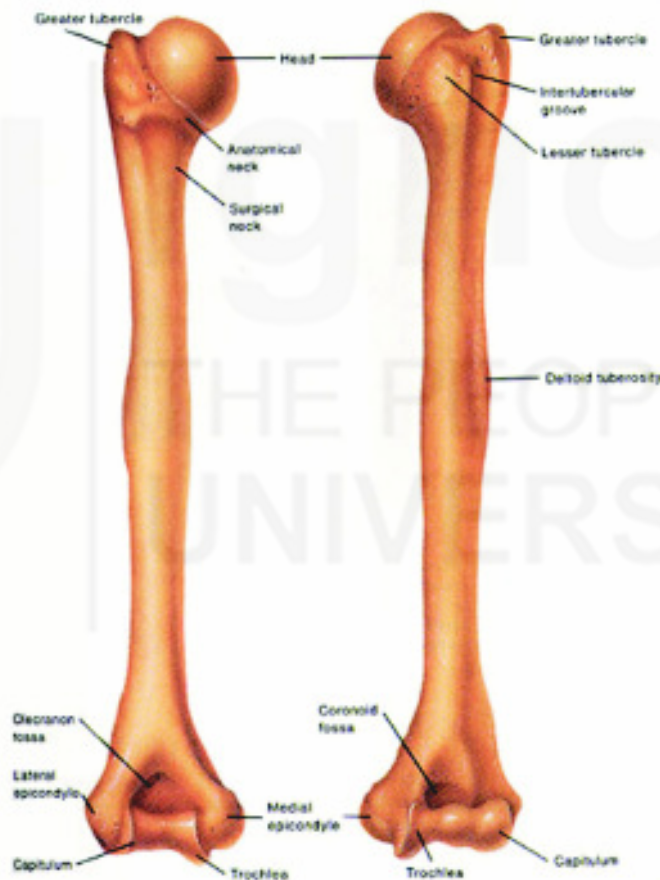


Fig.1.16: Humerus

Source: edoctoronline.com

Radius: Radius is the lateral bone of the forearm. It has two extended ends-the head and the lower end, and a shaft. The head at the upper end of the radius articulates laterally with the humerus and a notch of the ulna. On the shaft, just below the head is a process called the radial tuberosity. The lower end of the radius contains styloid process which is projected downwards from the lateral surface.

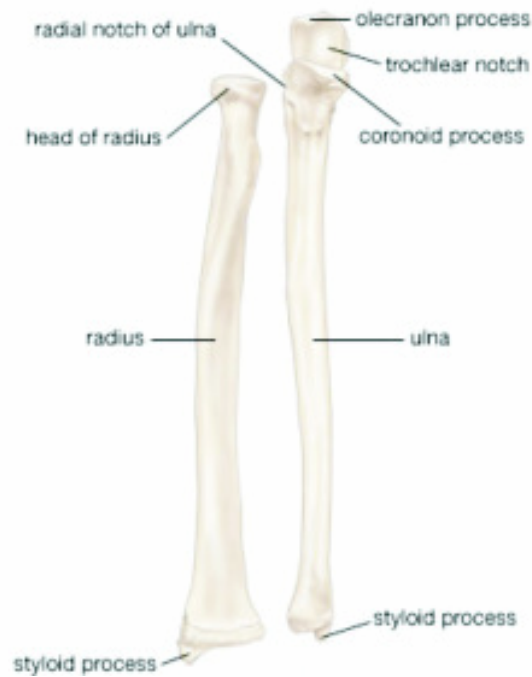


Fig. 1.17: Radius and Ulna

Source: britannica.com

Ulna: It is a thick, strong and its upper end looks like a hook. The Ulna bone faces anteriorly and is the medial bone of the forearm. The upper end has two processes the olecranon and the coronoid process. The lower end has the knoblike head of the ulna, articulates with a notch of the radius laterally and with a disk of fibrocartilage inferiorly. In cross-section the shaft of the ulna is triangular and becomes gradually narrow from the upper to the lower end.

Femur: The femur is the longest bone in the human body. The femur extends from the hip joint to the knee joint. It consists of upper and lower ends and a shaft. The upper end has a large rounded head, a neck and a greater and a lesser trochanter. The head of the femur projects medially into the acetabulum of the hip bone. The lower end of the femur consists of the two condyles – the lateral and medial condyles, which articulate with the head of the tibia (of the lower leg) and then patella (knee-cap).

The shaft of the femur at the anterior side is nearly cylindrical and convex while it is thinnest at the middle and widens more near the lower end when compared to above.

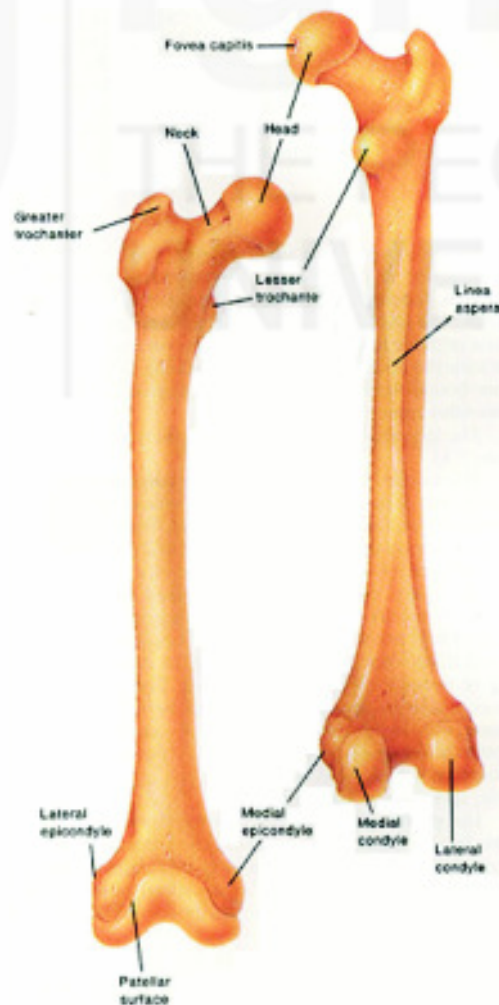


Fig.1.18: Femur

Source: edoctoronline.com

Tibia: The tibia is located on the medial side and the larger of the two lower leg bones. It consists of an upper end, lower end and a shaft. The upper end is expanded into two condyles, the medial and lateral condyles. These two have concave surfaces and articulate with the condyles of the femur. The lower end of tibia expands to form a prominence on the inner ankle called the medial malleolus. The lower end articulates with the trochlear surface of the talus at the ankle joint. The shaft of the tibia is triangular in cross-section and has three surfaces – medial, lateral and posterior, and three borders-anterior, interosseous and medial.

Fibula: The fibula is located on the lateral side of the tibia and is a long and slender one. It consists of a shaft, an upper end (head) and a lower end (the lateral malleolus). The head of the fibula articulates with the tibia just below the lateral condyle. The lateral malleolus articulates with the ankle and forms a eminence on the lateral side. The shaft of the fibula has three borders anterior, posterior and interosseous.

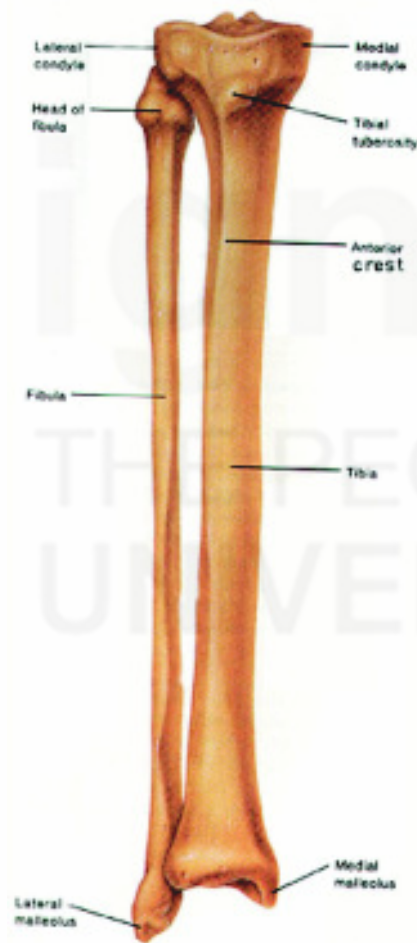


Fig. 1.19: Tibia and Fibula

Source: physioweb.org

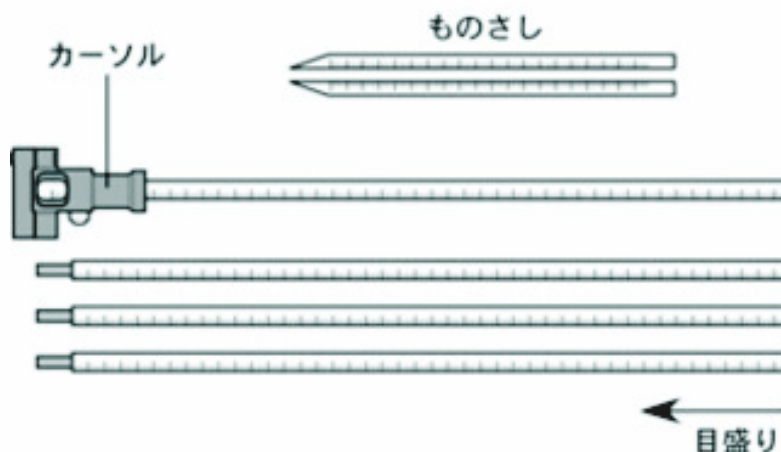
Craniometry (measurement of cranium), Mandibulometry (measurement of mandible) and Somatometry (measurement of the dimensions of body) involve different types of instruments for taking measurements depending upon its nature. Here we will mention briefly about the instruments to be used in our list of measurements.

Weighing machine: Standard weighing machine with a graduation of 500 grams, portable for field purpose and stationary weighing machines are used. The zero error should be adjusted with the knob provided. Weight of the subject with minimum clothing is preferred and adjustment for the clothes should be made.



Source:k3505907 www.fotosearch.com

Martin's Anthropometer: It is the most often used instrument in somatometry used for taking linear measurements. The anthropometer consists of four equal graduated segments which when joined tightly measures 200 cms. The graduation begins at the base of the lowest segment on one side and from uppermost segment on the other side on opposite side. The uppermost segment bears at its upper end fixed casket, while there is another casket which can move up and down along the oriented rod. The casket holds the cross bars which are also graduated. The movable casket provides an elongated window on its body, through which the graduations can be seen and upper border of this opening gives a particular measure.



Source:www.riodb.ibase.aist.go.

Rod compass: The first segment of the anthropometer used as a large sliding caliper by adjusting the crossbar is called rod compass. It is graduated in descending order starting from the top fitted with fixed socket. It is used to measure breadths or diameters.

Martin's Spreading caliper: It is mainly used for taking head and face measurements where curved areas are involved. It consists of two long arms which are curved outwards and straight on the other end which is screwed together so that arms can move freely. A meter scale (35cm) is fixed to one of the arms and passes through the socket of the second arm. The screw at the back socket provides to and fro movement to the scale. The free ends of the long arms are provided either with blunt (used in living beings) or pointed end (used in skeletons). Another large variety of spreading caliper having a scale of 60cm, used for measuring pelvis is called pelvimeter.



Source: www.theapricity.com

Martin's Sliding caliper: It consists of a long straight scale graduated on both sides and two cross bars, one fixed on one end of the scale and the other one parallel to the fixed one which can slide over the scale with the help of a socket provided with a screw to be used to fix the socket at any place. Both the arms are projected to an equal distance on both sides of the scale. The scale is graduated starting from the fixed end up to 250mm. Again from the free end it is graduated up to 50mm- this is used for measuring depths when the movable socket is fitted on the scale in reverse order. Sliding caliper is used to measure shorter breadths. The blunt ends are used to measure on body (living beings) while the sharp end on bones.



Source: www.riodb.ibase.aist.go

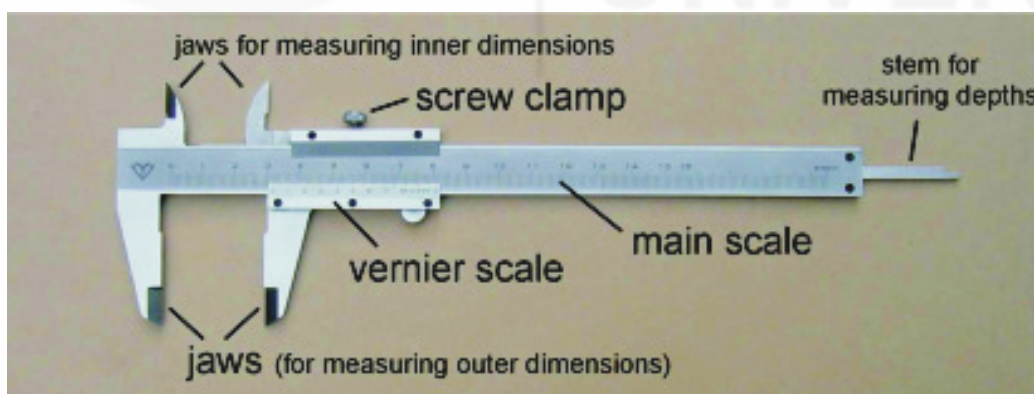
Skinfold caliper: The purpose of the skinfold caliper is to measure the thickness of the skinfold for assessment of subcutaneous fat at different sites of the body. Harpenden and Lange's skinfold calipers are mostly used for the purpose. The caliper consists of round clock like dial fitted with sturdy grip above which is an elongated lever. The caliper at the contact surface of the arms should be kept at a pressure of 10 gm/mm².



Harpenden's skinfold caliper

Source: www.physicalcompany.co.uk

Vernier caliper: Vernier calipers give readings of high accuracy. This caliper possesses a calibrated scale with fixed jaw and another one with a pointer that slides along the scale. The distance between the two jaws gives the reading depending upon its usage. Vernier calipers are used to measure internal dimensions, external diameters and depth.



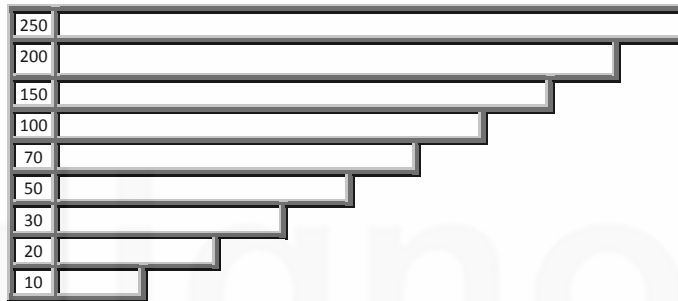
Source: www.phy.uct.ac.za

Steel tape: It is made of flexible steel graduated on both the sides wound in a metal case from which it can be pulled out and can rewind after use. It is used for measuring girths of different parts of body and skeleton which involves curvature.

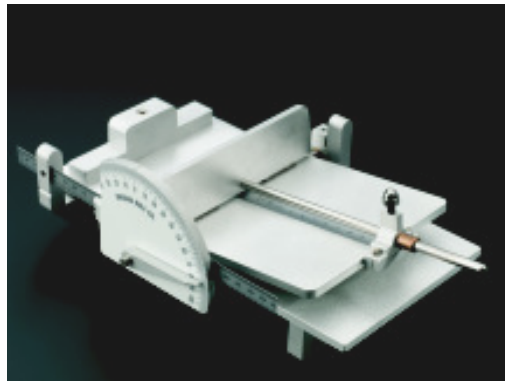


Source: www.oneinhundred.com

Verificator: It is also called Gauge and is used to verify the accuracy of the calipers. There are nine brass rods with different lengths varying from 10 to 250 mm.



Mandibulometer: A mandibulometer is a precision bone measuring (osteometric) instrument. An anthropologist or skeletal biologist uses it to measure the human lower jawbone. Professionals working in forensic science also use it. It consists of one horizontal plate, one vertical plate and a protractor. The horizontal plate serves as a base and graduated scale is there on both the sides. Near the rear end of the base is a vertical plate which is also provided with scales. This vertical plate is fixed with screws and it can be raised so as to suit the angle of mandible. This angle can be measured with protractor which is fixed at the intersection of the plates. Front side of the basal plate has a thick vertical piece, which can slide over the surface, and used to fix mandible on the front side.



Source: www.sciencemuseum.org.uk

Suggested Reading

The list is given at the end of unit 4.