

The Skeletal System

Practical Check List



Compiled for the purposes of practical anatomy
Physician education courses

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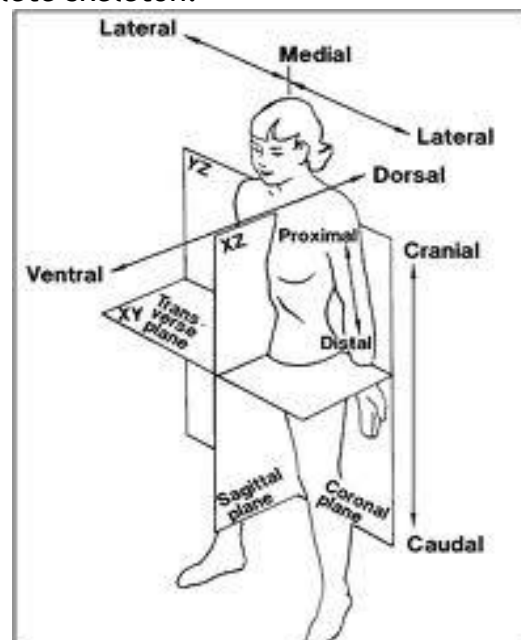
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I. General Skeletal System

1. Learn the term below using the complete skeleton:

- a. Median/paramedian/sagittal/ mid-sagittal plane
- b. Transversal/horizontal plane
- c. Coronal plane
- d. Oblique plane
- e. Cranial/superior
- f. Caudal/inferior
- g. Proximal
- h. Distal
- i. Medial
- j. Lateral
- k. Anterior/ventral/frontal
- l. Posterior/dorsal
- m. Internal
- n. External
- o. Profundus
- p. Superficialis



2. Classify the bones in your skeleton box based on its shapes into long bones, short bones, flat bones, and irregular bones!
3. Learn and identify the structure and composition of long bone below:
 - a. Diaphysis
 - b. Epiphysis
 - c. Caput
 - d. Collum
 - e. Facies articularis
 - f. Foramen nutricium
 - g. Endosteum
 - h. Cavum medullare
 - i. Substantia compacta
 - j. Substantia spongiosa
4. Identify the bones below:

Skeleton axiale	Cranium	Neurocranium	Os parietale	
			Os frontale	
			Os occipital	
			Os sphenoidale	
			Os temporal	
			Os ethmoidale	
		Viscerocranium	Os lacrimale	
			Os nasale	
			Os vomer	
			Os maxilla	
			Os palatium	
			Os zygomaticum	
			Os mandibulae	
Vertebrae	Vert. cervicales			
	Vert. thoracales			
	Vert. lumbales			
	Vert. sacrales			
	Vert. coccygeae			
Ossa costae				
Sternum	Manubrium sternum			
	Corpus sterni			
	Processus xiphoideus			
Skeleton appendiculare	Ekstremitas cranialis	Cingulum pectorale	Os scapulae	
			Os claviculae	
		Ossa membri superior	Os humerus	
			Os radius	
			Os ulna	
			Ossa manus	Carpalia
	Metacarpalia			
	Phalanx manus			
	Ekstremitas caudalis	Cingulum pelvicum (Pelvis)	Os coxae	Os ilii
				Os ischii
				Os pubis
		Ossa membri inferior	Os femur	
			Os patella	
Os tibia				
Os fibula				
Ossa pedis			Tarsalia	
	Metatarsalia			
	Phalanx pedis			

II. Axial Skeleton

Cranium

- A. Recognize the bones which develop neurocranium; viscerocranium; calvaria; basis cranii!
- B. Identify the border between neurocranium-viscerocranium; basis crania anterior-media-posterior
- C. Although ossification of the fontanels is normally complete by 20-24 months of age, you can predict identify their location. Find the remnant of location:
 - 1) fontanela anterior/major/frontal
 - 2) fontanela posterior/minor/occipital
 - 3) fontanela anterolateral/sphenoid
 - 4) fontanela posterolateral/mastoid
- D. In adult, suture will connect the adjacent cranial bones and close the fontanels. Find the sutures below:
 - 1) sutura sagittalis
 - 2) sutura lambdoidea
 - 3) sutura coronoidea
 - 4) sutura squamosa
 - 5) sutura metopica (if any, as a human variation)
- E. Recognize the important cavity among the skull below:
 - 1) Cavum cranii
 - 2) Cavum nasi
 - 3) Cavum orbitae

Cranial Bones

The cranial bones enclose and protect the brain and associated sensory organs. They consist of one frontal, two parietals, two temporal. One occipital, one sphenoid, and one ethmoid.

Identify the structures lie on the individual cranial bones below:

1. **Os frontale**

The frontal bone forms the anterior roof of the cranium, the forehead, the roof of the nasal cavity, and the superior arches of the *orbits*, which contain the eyeballs. Study its boundaries and find the structures below:

- margo supra orbitalis
- foramen supra orbitalis
- arcus superciliaris
- sulcus sagittalis
- crista frontalis
- sinus frontalis (if possible)

2. **Os parietale**

The two parietal bones form the upper sides and roof of the cranium. Inner concave surface is marked by shallow impressions from the vessels serving the brains. Find the structure below:

- linea temporalis inferior
- linea temporalis superior
- sulcus arteriosus and sulcus transversus

3. **Os temporale**

Os temporale consist of:

- a. pars squamosa (squama temporalis)
 - processus zygomaticus
 - fossa mandibularis
 - tuberculum articulare
- b. pars tympanica
 - meatus acusticus externus
 - processus styloideus
- c. pars mastoidea
 - foramen mastoideus
 - processus styloideus
- d. pars petrosa (pyramis)
 - meatus acusticus internus
 - canalis caroticus
 - foramen jugularis

4. Os occipitale

Find the structures below:

- Foramen magnum
- condylus occipitalis
- processus condyloideus
- canalis condyloideus
- canalis hypoglossus
- protuberantia occipitalis externa
- linea nuchae superior
- linea nuchae inferior (sometimes is not obvious)
- protuberantia occipitalis interna

5. Os sphenoidale

The sphenoid bone forms part of the anterior base of the cranium and can be viewed laterally and inferiorly. This bone has a mothlike shape and consists of:

- a. corpus ossis sphenoidale
 - sella turcica
 - processus clinoides posterior
 - sulcus chiasmaticus
 - sinus sphenoidale
- b. processus pterygoideus
 - lamina lateralis medialis et medialis
- c. ala magna ossis sphenoidale
- d. ala parva ossis sphenoidale

QUIZ: Several foramina are associated with the wings of sphenoid bone. Find the foramina and complete the table below:

No.	Foramen	Structures transmitted
1	Canalis opticus	
2	Fissure orbitalis superior	
3	Foramen ovale	
4	Foramen spinosum	
5	Foramen lacerum	
6	Foramen rotundum	

6. Os ethmoidale

The ethmoid bone is located in the anterior portion of the floor of the cranium, where it forms the roof of the nasal cavity.

- lamina cribrosa
- foramina cribiformis
- lamina perpendicularis
- crista gali
- concha nasalis media
- concha nasalis superior
- cellulae ethmoidalis

Facial Bones

The 14 bones of the skull not in contact with the brain are called facial bones/viscerocranium/splanchnocranium. Facial bones also support the teeth and provide attachments for various muscles that move the jaw and cause facial expression.

1. Os maxilla

The two maxillae unite at the midline to form the upper jaw and supports the upper teeth. Identify the structures below:

- Incisors
- Canines
- Premolars
- molars
- processus alveolaris
- processus palatinus → forms anterior portion of palatum durum
- foramen incisivum
- foramen infraorbitale
- fissure orbitalis inferior
- sinus maxillaries and hiatus maxillaries (if possible)

2. Os palatum

Os palatum form the posterior third of the hard palate (palatum durum), a part of the orbit, and a part of nasal cavity. Find the structures below:

- lamina horizontalis
- lamina perpendicularis
- foramen palatina majus and minora

3. Os zygomaticum

Study the relationship between zygomatic bone with the adjacent bones, and then find *foramen zygomaticofacialis* located on the anterolateral of this bone.

4. Os lacrimale

The thin lacrimal bones form the anterior part of the medial wall of each orbit. Study the relationship between lacrimal bone with the adjacent bones and find *sulcus lacrimalis* and *canalis nasolacrimalis* that permits the tears of the eye to drain into the nasal cavity.

5. Os nasale

6. Concha nasalis inferior

Find this bone in the nasal cavity (cavum nasi) and study its attachment to the maxilla and the position related to hiatus maxillaries and canalis nasolacrimalis!

7. Os vomer

The vomer forms the lower part of the nasal septum (septum nasi). Find this bone in the cavum nasi and study its position related to the adjacent bones.

8. Os mandibula

The mandible is the largest and the strongest bone in the face. What structure which joint the mandible with the skull?

What the name of this joint?

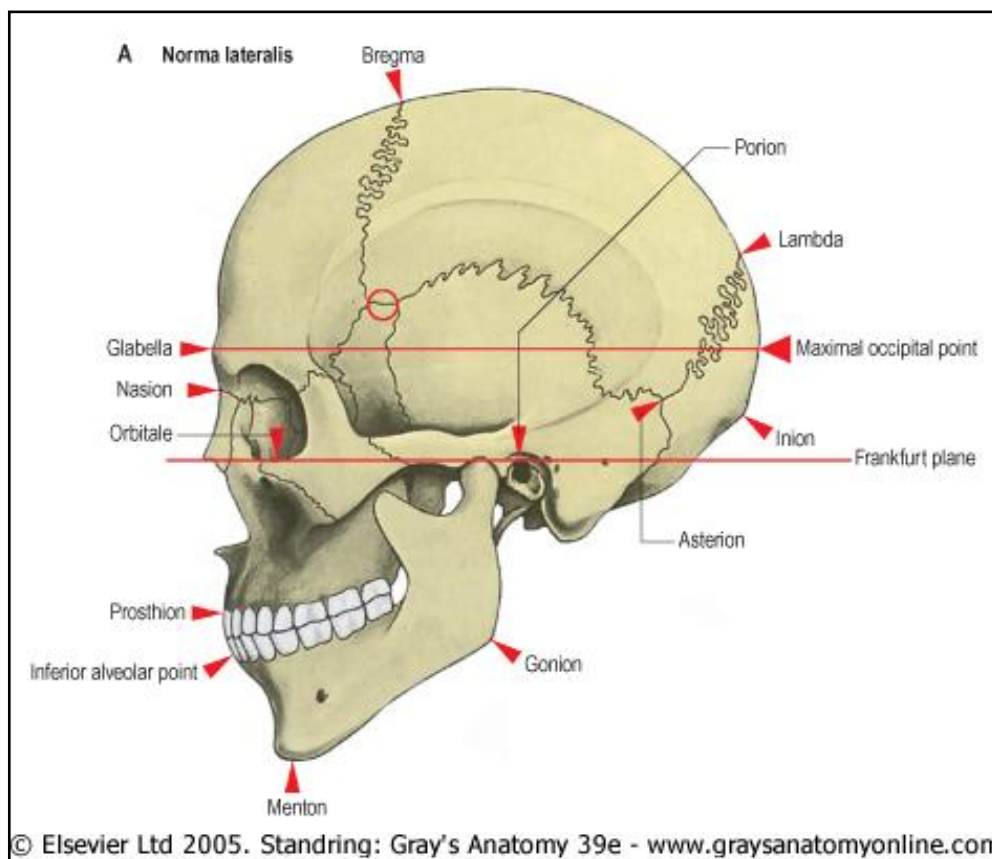
The mandible consists of *corpus mandibulae* and *ramus mandibulae* which connected by *angulus mandibulae*.

Find the structures below:

- Processus condyloideus
- Processus coronoideus
- Incisura mandibulae
- Foramen mentalis
- Foramen mandibularis
- Lingula mandibulae
- Protuberantia mentalis
- Spina mentalis
- Linea mylohyoidea

Metrical studies are used to compare shapes and sizes of skulls. The most frequently used, the breadth/length ratio, is called the cranial/cephalic index (CI). Variation in the CI use in distinguishing skull from different geographic regions and reflect interactions between the width of the cranial base and the volume of the brain.

Identify the cranial points below:



Truncus

- A. Identify the bones of the five regions of the vertebral column and count the bone of each part:
- 1) vertebrae cervicales
 - 2) vertebrae thoracales
 - 3) vertebrae lumbales
 - 4) vertebrae sacrales
 - 5) vertebrae coccygeales
- B. Study the characteristic curves of each region using complete skeletal frame. There are: kyphosis thoracalis, lordosis lumbalis, lordosis cervicalis and kyphosis sacralis, then find *canalis vertebralis* and *foramina intervertebralis*.
- C. Identify the general structure of individual vertebrae:
- 1) Corpus vertebrae
 - 2) Arcus vertebrae, consist of two pediculus, two lamina vertebrae, two processus transverses, two processus articularis superior, two processus articularis inferior, and one processus spinosus
 - 3) Foramen vertebralis
- D. Study the differences between vertebrae cervicales, vertebrae thoracales and vertebrae lumbales.
- E. Identify the structures on each vertebrae below:
1. **Vertebrae cervicales**
Foramen transversus in each processus transverses and *bifid of processus spinosus* (except v. cervicalis VII) distinguish vertebrae cervicalis with others. Find the structures written in italic above!
 - a. Vertebrae cervicales I (Atlas)
 - tuberculum anterius atlantis
 - tuberculum posterior atlantis
 - fovea dentis
 - facies articularis superior and inferior
 - sulcus arteriae vertebralis
 - b. Vertebrae cervicales II (epistropheus)
 - dens epistrophei
 - facies articularis anterior dentis
 - facies articularis posterior dentis
 - facies articularis superior
 - processus articularis inferior

QUIZ: Study the correlation between os atlas with cranium and epistropheus!

2. **Vertebrae thoracales**

Each vertebrae thoracales has *fovea costalis corporis* (on each lateral side of corpus, some have both *fovea costalis superior and inferior*) and *fovea costalis transversalis* (on processus transverses) for articulation with the ribs. *Incisura vertebralis superior and inferior* connect to form foramen intervertebralis.

Find the structures written in italic above!

3. **Vertebrae lumbales**

The five lumbar vertebrae are easily identified by their heavy bodies and thick, blunt processus spinosus for attachment of powerful back muscles.

Identify the specific structure below:

- processus mammilaris
- processus accessorius (sometimes difficult to indentify)

4. Os sacrum

Os sacrum provides a strong foundation for the pelvic girdle. It consists of four or five vertebrae sacralis that become fused after age 26. Can you recognize the remnants of its boundary?

Find the structure below:

- promontorium
- facies articularis, which joint with coxae to form sacroiliaca joint.
- foramen sacralia anteriora
- crista sacralis media
- crista sacralis lateralis
- foramina sacralia posteriora
- foramina sacralia anterior (pelvina)
- hiatus sacralis → the opening to canalis sacralis
- cornu sacralis
- processus articularis superior
- tuberositas sacralis

5. Os coccygeus

The tailbone is composed of three to five fused vertebrae coccygeus. The 1st coccygeus has two long *cornu coccygeus* and the lateral to the cornua are the processus transverses.

The rib cage consists of v.thoracales, 12 paired costae, cartilage costalis, and the sternum. It encloses viscera and is involved in the mechanical breathing.

1. Costae

Study the costae using complete skeleton and its correlation with sternum. And find *costae verae*, *costae spuriae*, and *costae fluctuantes*

Find the structure on individual costae:

- capitulum costae
- collum costae
- corpus costae
- angulus costae, connects the capitulum costae with corpus costae
- sulcus costae
- facies articularis superior capituli costae
- facies articularis inferior capituli costae
- crista capituli costae
- tuberculum costae

2. Sternum

Find the structure below:

- Manubrium sterni
- corpus sterni
- processus xiphoideus
- incisura jugularis
- incisura clavicularis
- incisura costalis

III. Appendicular Bones

Extremitas cranialis/superior

Pectoral girdle/cingulum pectorale

1. Clavicula

Distinguish the structure of clavicula below:

- Extremitas sternalis/medialis
- Ekstremitas acromialis/lateralis

Note the location of clavicula related to the scapula and sternum.

2. Scapulae

Recognize the *margo superior*, *margo axillaris*, *margo vertebralis*, *angulus medialis*, *angulus lateralis*, *angulus inferior* of scapulae!

Identify the structures below:

- Spina scapula
- Fossa supraspinatus
- Fossa infraspinatus
- Acromion
- Processus coracoideus
- Incisura/foramen scapulae
- Cavitas glenoidalis
- Tuberositas infraglenoidalis
- Tuberositas supraglenoidalis

Pars liberae

1. Humerus

- Caput humeri
- Collum anatomicum
- Collum chirurgicum
- Tuberculum majus
- Tuberculum minus
- Sulcus intertubercularis
- Tuberositas deltoidea
- Sulcus nervi radialis
- Epicondylus medialis
- Epicondylus lateralis
- Sulcus nervi ulnaris
- Fossa olecrani
- Fossa coronoidea
- Trochlea humeri
- Capitulum humeri

2. Radius

Find the structures below:

- Capitulum radii
- Fovea capituli radii
- circumferentia articularis radii
- collum radii
- tuberositas radii
- crista interossea
- processus styloideus
- incisura ulnaris radii

Note the grooves for hand's muscle tendons on the surface of distal end of radius!

3. Ulna

Find the structures below:

- olecranon
- incisura semilunaris
- processus coronoideus
- tuberositas ulnae
- crista interossea
- processus styloideus

4. Ossa carpalia

Proximal row, from medial to lateral:

- os naviculare manus
- os lunatum
- os triquetrum
- os pisiforme

Distal row, from medial to lateral:

- os multangulum majus
- os multangulum minus
- os capitatum
- os hamatum

5. Ossa metacarpalia

Recognize the metacarpalia I, and note the proximal end of metacarpalia I, what the difference with others?

6. Ossa phalanges

Extremitas caudalis/inferior

Pelvic girdle/cingulum pelvicum

The pelvic girdle is formed by two ossa coxae and united anteriorly at the symphysis pubis. The basinlike structure is called the *pelvis*. The pelvic girdle also supports and protects the lower viscera, including the urinary bladder, the reproductive organs, and the developing fetus. Pelvis is divided into *pelvis major* and *pelvis minor* which divided by *additus pelvis* (pelvic brim, a curved bony rim passing inferiorly from the sacral promontorium to the upper margin of the symphysis pubis). The lower circumference of the lesser pelvis bounds the *exitus pelvis*.

Identify the structures of the coxae below:

- acetabulum
- incisura acetabuli
- fossa acetabuli
- facies lunata
- foramen obturatorium

Each coxae consists of three bones: *the illium, the ischium, the pubicum*

Identify the structures of individual bones of coxae:

1. Os ilium

- ala ossis ilii
- linea arcuata
- spina iliaca anterior superior (SIAS)
- spina iliaca anterior inferior

- spina iliaca posterior superior
- spina iliaca posterior inferior
- fossa iliaca
- crista iliaca
- facies auricularis

2. Os ischii

- tuber ischiadicum
- spina ischiadica
- incisura ischiadica mayor
- incisura ischiadica minor

3. Os pubis

- tuberculum pubicum

QUIZ: Distinguish between male and female pelvis!

Pars liberae

1. Femur

- caput femoris
- collum femoris
- fovea capitis
- trochanter major
- trochanter minor
- crista intertrochanterica
- linea intertrochanterica
- linea aspera
- tuberositas glutealis (gluteae)
- planum popliteum
- condylus medialis
- condylus lateralis
- fossa intercondyloidea
- epicondylus medialis
- epicondylus lateralis
- facies patellaris

2. Tibia

- condylus medialis
- condylus lateralis
- eminentia intercondyloidea
- facies articularis fibularis tibiae
- tuberositas tibiae
- crista anterior tibiae
- crista interossea
- linea poplitea
- malleolus medialis
- incisura fibularis

3. Fibula

- capitulum fibulae
- facies articularis tibialis fibulae
- malleolus lateralis
- crista interossea
- apex capituli fibulae

4. Ossa tarsalia

- a) os talus
 - caput tali
 - collum tali
 - trochlea tali
 - sulcus tali
- b) os calcaneus
 - tuber calcanei
 - sulcus calcanei
 - sustentaculum tali
- c) os naviculare pedis
 - tuberositas ossis naviculare
- d) os cuboideum
- e) ossa cuneiforme I, II, III

QUIZ: Study the correlation between ossa tarsalia with tibia-fibula!

5. Ossa metatarsalia**6. Ossa phalanges**

QUIZ: Distinguish the right side (DEXTRA) and the left side (SINISTRA) of extremity bones, including cingulum and pars liberae!