

Chapter 7

LECTURE OUTLINE

A. Divisions of the Skeletal System (p. 164)

1. The 206 named bones in the adult skeleton are grouped in two major divisions (see Table 7.1):
 - i. **axial skeleton** consists of the 80 bones located around the longitudinal axis of the body:
 - a. skull bones
 - b. auditory ossicles
 - c. hyoid bone
 - d. vertebral column
 - e. sternum
 - f. ribs
 - ii. **appendicular skeleton** consists of 126 bones that form:
 - a. pectoral (shoulder) girdles
 - b. upper extremities
 - c. pelvic (hip) girdle
 - d. lower extremities

B. Types of Bones (p. 164)

1. Almost all bones are classified on the basis of **shape** into five major types:
 - i. **long bones**
 - ii. **short bones**
 - iii. **flat bones**
 - iv. **irregular bones**
 - v. **sesamoid bones**, which are (typically) small bones embedded in tendons
2. There is one additional type of bone that is classified by **location**:
 - i. **sutural (or Wormian) bones**, which are located in the joints between certain cranial bones

C. Bone Surface Markings (p. 167)

1. The surfaces of bones have **surface markings**, structural features that are adapted to **specific functions**; the two major types of surface markings are:
 - i. depressions and openings
 - ii. processes
2. Important surface markings (see Table 7.2) include **fissure, foramen, fossa, sulcus, meatus, process, condyle, facet, head, crest, epicondyle, line, spinous process, trochanter, tubercle, and tuberosity**.

D. Skull (p. 168)

1. The skull consists of 22 bones (see Table 7.3):
 - i. 8 **cranial bones** that form the cranial cavity to enclose and protect the brain
 - ii. 14 **facial bones** that form the face
2. The 8 cranial bones (each having specific **surface markings**) are:
 - i. **frontal bone**
 - a. **frontal squama (vertical plate)**
 - b. **supraorbital margin**

- c. **supraorbital foramen**
 - d. **frontal sinuses**
 - ii. two **parietal bones**
 - iii. two **temporal bones**, each one having:
 - a. **temporal squama**
 - b. **zygomatic process** (which contributes to the **zygomatic arch**)
 - c. **mandibular (glenoid) fossa**
 - d. **articular tubercle**
 - e. **mastoid portion**
 - f. **external auditory (acoustic) meatus**
 - g. **mastoid “air cells”**
 - h. **mastoid process**
 - i. **internal auditory (acoustic) meatus**
 - j. **styloid process**
 - k. **stylomastoid foramen**
 - l. **petrous portion**
 - m. **carotid foramen**
 - n. **jugular foramen**
 - iv. **occipital bone**
 - a. **foramen magnum**
 - b. **occipital condyles**
 - c. **hypoglossal foramen**
 - d. **external occipital protuberance**
 - e. **superior nuchal lines**
 - f. **inferior nuchal lines**
 - v. **sphenoid bone**
 - a. **body**
 - b. **sphenoidal sinuses**
 - c. **sella turcica**
 - d. **greater wings** (each having a foramen ovale)
 - e. **lesser wings**
 - f. **optic foramen**
 - g. **superior orbital fissure**
 - h. **pterygoid processes**
 - vi. **ethmoid bone**
 - a. **lateral masses**
 - b. **ethmoidal sinuses**
 - c. **perpendicular plate**
 - d. **cribriform plate**
 - e. **olfactory foramina**
 - f. **crista galli**
 - g. **superior nasal conchae (turbinates)**
 - h. **middle nasal conchae (turbinates)**
3. The 14 facial bones (each having specific **surface markings**) are:
- i. two **nasal bones**
 - ii. two **maxillae**, each one having:
 - a. **maxillary sinus**
 - b. **alveolar process with alveoli**
 - c. **palatine process**
 - iii. two **zygomatic bones**, each one having:
 - a. **temporal process** (which contributes to the **zygomatic arch**)

- iv. two **lacrimal** bones, each one having:
 - a. **lacrimal fossa**
- v. two **palatine** bones, each one having:
 - a. **horizontal plates**
- vi. two **inferior nasal conchae (turbinates)**
- vii. **vomer**
- viii. **mandible**
 - a. **body**
 - b. **rami**
 - c. **angle**
 - d. **condylar process**
 - e. **temporomandibular joint**
 - f. **coronoid process**
 - g. **mandibular notch**
 - h. **alveolar process with alveoli**
 - i. **mental foramen**
 - j. **mandibular foramen**
 - k. **mandibular canal**

E. Unique Features of the Skull (p. 182)

1. The **nasal septum**, formed by the vomer, septal cartilage, and perpendicular plate of the ethmoid bone, divides the nasal cavity into right and left compartments.
2. The **orbits** are deep sockets (each having a roof, lateral wall, floor, and medial wall), formed by several bones, that house the eyeballs and associated structures.
3. The skull bones contain numerous **foramina** (see Table 7.4) that are passageways for blood vessels and nerves.
4. **Sutures** are immovable joints located between skull bones; four notable sutures are:
 - i. **coronal suture**
 - ii. **sagittal suture**
 - iii. **lambdoid suture**
 - iv. (two) **squamous sutures**
5. **Paranasal sinuses** are paired cavities located in certain skull bones;
 - i. they are lined with mucous membranes that are continuous with the lining of the nasal cavity
 - ii. they produce mucus and serve as resonating chambers for sound
 - iii. they are located in the maxillae, frontal, sphenoid, and ethmoid bones.
6. **Fontanels** are fibrous connective tissue membrane-filled spaces located between the cranial bones of infants; their function is to:
 - i. enable the fetal skull to modify its shape as it passes through the birth canal
 - ii. permit rapid growth of the brain during infancy.

Major fontanels are:

- a. **anterior (frontal) fontanel**
- b. **posterior (occipital) fontanel**
- c. two **anterolateral (sphenoid) fontanels**
- d. two **posterolateral (mastoid) fontanels**

Fontanels become ossified during the first two years of childhood.

7. The **cranial fossae** are three levels on the floor of the cranial cavity:
 - i. **anterior cranial fossa**
 - ii. **middle cranial fossa**
 - iii. **posterior cranial fossa**

F. Hyoid Bone (p. 186)

1. The hyoid bone is a U-shaped bone, located in the upper neck, that does not articulate with any other bone.
2. It supports the tongue and is an attachment site for several tongue, neck, and pharynx muscles.
3. Its major surface markings are:
 - i. **body**
 - ii. **lesser horns**
 - iii. **greater horns**

G. Vertebral Column (p. 186)

1. The **vertebral column (spine or backbone)** is a strong, flexible rod that:
 - i. surrounds and protects the spinal cord
 - ii. supports the head
 - iii. serves as a site of attachment for ribs and back muscles.
2. It is formed by 26 **vertebrae**:
 - i. **7 cervical vertebrae**
 - ii. **12 thoracic vertebrae**
 - iii. **5 lumbar vertebrae**
 - iv. one **sacrum** formed by fusion of **5 sacral vertebrae**
 - v. one (or two) **coccyx** formed by fusion of (usually) **4 coccygeal vertebrae**
3. **Intervertebral discs** are located between neighboring vertebrae (from C2 down to the sacrum):
 - i. each consists of an outer **annulus fibrosus** and an inner **nucleus pulposus**
 - ii. they form strong joints, permit various movements of the spine, and absorb vertical shock
4. The vertebral column has four alternating **normal curves**:
 - i. anteriorly convex cervical curve
 - ii. anteriorly concave thoracic curve
 - iii. anteriorly convex lumbar curve
 - iv. anteriorly concave sacral curve

At birth, there is only a single anteriorly concave curve; the cervical and lumbar (i.e., secondary) curves develop in the early months of infancy as the child begins to hold its head erect and as the child begins to sit and walk, respectively.

The four curves function to:

- a. increase the strength of the spine
 - b. help maintain balance in the upright position
 - c. absorb shocks from walking and jumping
 - d. help protect the spine from fracture.
5. A typical vertebra has the following structural features:
 - i. **body**
 - ii. **vertebral arch**, which consists of:
 - a. two **pedicles**
 - b. two **laminae**
 - iii. 7 processes:
 - a. two **transverse processes**
 - b. one **spinous process (spine)**
 - c. two **superior articular processes** with **facets**
 - d. two **inferior articular processes** with **facets**

As a consequence of the above structural features, each vertebra has a **vertebral foramen** (all the vertebral foramina in the spine are aligned to form the **vertebral**

- (**spinal**) **canal**) and there are **intervertebral foramina** located between neighboring vertebrae.
6. There are unique structural features in each of the vertebrae in the cervical (e.g., **atlas**, **axis**), thoracic, and lumbar regions of the spine (see Table 7.5).
 7. Important surface markings of the **sacrum** include:
 - a. **transverse lines (ridges)**
 - b. **anterior sacral foramina**
 - c. **sacral ala**
 - d. **median sacral crest**
 - e. **lateral sacral crest**
 - f. **posterior sacral foramina**
 - g. **sacral canal**
 - h. **sacral hiatus**
 - i. **sacral cornua**
 - j. **sacral promontory**
 - k. **auricular surfaces**
 - l. **sacral tuberosity**
 - m. **superior articular processes**
 8. Important surface markings of the **coccyx** are **coccygeal cornua** and **transverse processes**.

H. Thorax (p. 195)

1. The skeletal portion of the thorax (chest) is a cage formed by several bones; the thoracic cage surrounds and protects organs in the thoracic cavity and upper abdominal cavity as well as providing support for the bones of the pectoral girdles and upper limbs.
2. The bones (each having specific **surface markings**) of the thoracic cage are:
 - i. **sternum**, which consists of (three) major regions and major surface markings:
 - a. **manubrium**
 - b. **body**
 - c. **xiphoid process**
 - d. **sternal angle**
 - e. **suprasternal (jugular) notch**
 - f. **clavicular notches**
 - ii. 12 pairs of **ribs**:
 - a. pairs 1-7 are **true (vertebrosternal) ribs**, which are attached directly to the sternum by **costal cartilage**
 - b. pairs 8-12 are **false ribs**
 - pairs 8-10 are **vertebrochondral ribs**
 - pairs 11-12 are **floating (vertebral) ribs**
 - c. important surface markings are:
 - **head**
 - **facets**
 - **neck**
 - **tubercle (both articular and nonarticular parts)**
 - **body (shaft)**
 - **costal angle**
 - **costal groove**
 - d. **intercostal spaces** are spaces between neighboring ribs
 - e. structures pass through the **superior** and **inferior thoracic apertures**
 - iii. **12 thoracic vertebrae**

I. Key Medical Terms Associated with the Axial Skeleton (p. 200)

1. Students should familiarize themselves with the glossary of key medical terms.