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.