

CHAPTER 8

LECTURE OUTLINE

I. INTRODUCTION

- A. The appendicular skeleton includes the bones of the upper and lower extremities and the shoulder and hip girdles.
- B. The appendicular skeleton functions primarily to facilitate movement.

II. PECTORAL (SHOULDER) GIRDLE

- 1. The pectoral or shoulder girdle attaches the bones of the upper limbs to the axial skeleton (Figure 8.1).
- 2. The pectoral girdle bones are discussed in Exhibits 8.A and 8.B.

A. Clavicle

- 1. The clavicle or collar bone lies horizontally in the superior and anterior part of thorax superior to the first rib and articulates with the sternum and the clavicle (Figure 8.2).
- 2. **Clinical Connection:** The clavicle, one of the most frequently broken bones in the body, transmits mechanical force from the upper limb to the trunk.

B. Scapula

- 1. The scapula or shoulder blade articulates with the clavicle and the humerus (Figure 8.3).
- 2. The scapulae articulate with other bones anteriorly, but are held in place posteriorly only by complex shoulder and back musculature.

III. UPPER LIMB (EXTREMITY)

- 1. Each upper limb consists of 30 bones including the humerus, ulna, radius, carpals, metacarpals, and phalanges (Figure 8.4).

A. Humerus

- 1. The humerus is the longest and largest bone of the upper limb (Figure 8.4).
- 2. It articulates proximally with the scapula and distally at the elbow with both the radius and ulna.

B. Ulna and Radius

- 1. The ulna is located on the medial aspect of the forearm (Figure 8.5).

2. The radius is located on the lateral aspect (thumb side) of the forearm (Figure 8.5)
3. The radius and ulna articulate with the humerus at the elbow joint (Figure 8.6a), with each other (Figure 8.6b, c), and with three carpal bones. (Figure 8.7)

C. Carpals, Metacarpal, and Phalanges

1. The eight carpal bones, bound together by ligaments, comprise the wrist (Figure 8.7).
2. Five metacarpal bones are contained in the palm of each hand (Figure 8.7).
3. Each hand contains 14 phalanges, three in each finger and two in each thumb (Figure 8.7).
4. **Clinical Connection:** Boxers Fracture

IV. PELVIC (HIP) GIRDLE

1. The pelvic (hip) girdle consists of two hipbones (coxal bones) and provides a strong and stable support for the lower extremities, on which the weight of the body is carried (Figure 8.8).
 - A. Each hip bone (coxal bone) is composed of three separate bones at birth: the ilium, pubis, and ischium.
 1. These bones eventually fuse at a depression called the acetabulum, which forms the socket for the head of the femur (Figure 8.9a).
 - B. The ilium is the larger of the three components of the hip bone and articulates (fuses) with the ischium and pubis (Figure 8.9b,c).
 - C. The ischium is the inferior, posterior portion of the hip bone (Figure 8.9b,c).
 - D. The pubis is the anterior and inferior part of the hip bone (Figure 8.9b,c).

V. TRUE AND FALSE PELVES

1. Together with the sacrum and coccyx, the two hipbones (coxal bones) form the pelvis.
2. The greater (false) and lesser (true) pelvis are anatomical subdivisions of this basin-like structure (Figure 8.10a).
3. **Clinical Connection:** Pelvimetry: Measurement of the pelvis is important in determining the need for surgery to allow birth

VI. COMPARISON OF FEMALE AND MALE PELVES

1. Male bones are generally larger and heavier than those of the female; the male's joint surfaces also tend to be larger.
2. Muscle attachment points are more well-defined in the bones of a male than of a female due to the larger size of the muscles in males.
3. A number of anatomical differences exist between the pelvic girdles of females and those of males, primarily related to the need for a larger pelvic outlet in females to facilitate childbirth (Table 8.1).

VII. LOWER LIMB (EXTREMITY)

1. Each lower extremity is composed of 30 bones, including the femur, tibia, fibula, tarsals, metatarsals, and phalanges (Figure 8.11-8.12).

A. Femur

1. The femur or thighbone is the largest, heaviest, and strongest bone of the body (Figure 8.11).
2. It articulates with the hip bone and the tibia but NOT the fibula.

B. Patella

1. The patella or kneecap is a sesamoid bone located anterior to the knee joint (Figure 8.12).
2. It functions to increase the leverage of the tendon of the quadriceps femoris muscle, to maintain the position of the tendon when the knee is bent, and to protect the knee joint.
3. **Clinical Connection:** Patellofemoral stress syndrome is a common knee problem in runners.

C. Tibia and Fibula

1. The tibia or shinbone is the larger, medial, weight-bearing bone of the leg (Figure 8.13).
2. The fibula is parallel and lateral to the tibia (Figure 8.13) and does NOT bear weight.
 - a. **Clinical Connection:** Because the fibula is not a weight bearing bone, it is a good source for bone grafting.

D. Tarsals, Metatarsals, and Phalanges

1. Seven tarsal bones constitute the ankle and share the weight associated with walking (Figure 8.14).
2. Five metatarsal bones are contained in the foot (Figure 8.14).

3. The arrangement of phalanges in the toes is the same as that described for the fingers and thumb above - fourteen bones in each foot (Figure 8.14).
 - a. **Clinical Connection:** Metatarsals are frequently broken

E. Arches of the Foot

1. The bones of the foot are arranged in two nonrigid arches that enable the foot to support the weight of the body; provide an ideal distribution of body weight over the hard and soft tissues, and provide leverage while walking (Figure 8.15).
2. **Clinical Connection:** Flatfoot and clawfoot are caused by decline, elevation, or rotation of the medial longitudinal arches.

VIII. Development of the Skeletal System

A. Most skeletal tissue arises from mesenchymal cells, connective tissue cells derived from mesoderm.

1. The Bones that form directly within the mesenchyme form through the process of intramembranous ossification (Figure 6.5).
2. Bones that form within hyaline cartilage are through the process of endochondral ossification(Figure 6.6).

B. The skull

1. begins development during the fourth week after fertilization.
2. develops from mesenchyme around the developing brain and consists of two major portions
3. neurocranium (mesodermal in origin), which forms the bones of the skull
4. viscerocranium (ectodermal in origin), which forms the bones of the face (Figure 8.16a).

C. Vertebrae and ribs

1. derived from portions of cube-shaped masses of mesoderm called somites (see Figure 10.17).
 - a. Mesenchymal cells from these regions surround the notochord (see Figure 10.17) at about 4 weeks after fertilization.
 - 1) The notochord is a solid cylinder of mesodermal cells

D. The skeleton of the limbs

1. Derived from mesoderm.
2. The upper limbs appear as small elevations at the sides of the trunk called upper limb buds (Figure 8.16b).

- a. The limb buds consist of mesenchyme covered by ectoderm.
- b. By the sixth week, the limb buds develop a constriction around the middle portion. (Figure 8.16c).
- c. By the seventh week (Figure 8.16d), the arm, forearm, and hand are evident in the upper limb bud, and the thigh, leg, and foot appear in the lower limb bud.
- d. By the eighth week (Figure 8.16e), as the shoulder, elbow, and wrist areas become apparent
- e. By the twelfth week, primary ossification centers are present in most of the limb bones.
- f. Most secondary ossification centers appear after birth.

IX. FOCUS ON HOMEOSTASIS: THE SKELETAL SYSTEM

- A. Examines the skeletal system's contribution to homeostasis

X. DISORDERS: HOMEOSTATIC IMBALANCE

- A. The term hip fracture most commonly applies to a break in the bones associated with the hip joint.
- B. Hip fractures often require surgical treatment.

XI. MEDICAL TERMINOLOGY - Students should be reminded to study the medical terminology associated with the appendicular skeleton.