

# Articulations and Movement

## Chapter 8

### DESCRIPTION OF SELECTED JOINTS

#### Shoulder Joint

FIGURE 8.28

1. The **shoulder joint** is formed by the head of the humerus and the glenoid fossa of the scapula.
  - A. The depth of the glenoid fossa is increased slightly by a fibrocartilage ring called the **glenoid labrum**.
  - B. The shoulder joint is supported by the joint capsule and a number of surrounding ligaments. In addition, surrounding muscles called the **rotator cuff** (not shown) also provide support. More on the rotator cuff when we get to muscles.
  - C. Several bursae, e.g. the subacromial bursa, are associated with the joint and provide protection from surrounding muscles and their tendons.
  - D. The shoulder joint is unusual in that the tendon from the biceps brachii muscle actually passes through the joint capsule to attach to the scapula.
- ☞ The shoulder joint is a ball-and-socket joint that allows many types of movement. Name the types of movement possible.
2. Disorders of the shoulder joint.
  - A. Dislocation (movement of the head of the humerus out of the glenoid fossa) most commonly occurs in an inferior direction because this side of the joint has no major muscles or ligaments.
  - B. Chronic disorders include bursitis (inflammation of the bursa), tendonitis (inflammation of a tendon), and arthritis (inflammation of the joint, e.g., the synovial membrane or articular cartilage).

## Hip Joint

FIGURE 8.30

1. The **hip joint** is formed by the head of the femur and the acetabulum of the coxa.
  - A. The depth of the hip joint is increased slightly by a fibrocartilage ring called the **acetabular labrum** and by the **transverse acetabular ligament**.
  - B. The **ligamentum teres** extends from the coxa to the head of the femur. It functions as a bridge for a nutrient artery for the articular cartilage (in 80% of the population). It provides little support to hold the femur in the acetabulum.
  - C. The hip joint is supported by the joint capsule and several ligaments.
2. Disorders of the hip joint.
  - A. Dislocation of the hip can occur when the hip is flexed and the femur is driven posteriorly, e.g., in an auto accident.
  - B. A broken hip usually refers to a break in the neck of the femur. There is a break in the hip region, but the hip bone (coxa) is not broken.

FIGURE C, p. 190

- ☞ Two identical twins are admitted to an emergency room. Twin A's lower limb is medially rotated, adducted, and slightly flexed. Twin B's lower limb is laterally rotated. Can you determine which one has a dislocated hip and which one has a broken hip? Explain (Hint: in which limb position is the head of the femur most likely to be out of the acetabulum?)

- C. Degenerative joint disease (DJD) or osteoarthritis is "wear and tear" of the articular cartilage and the development of bony spurs in the joint. It typically develops in weight-bearing joints. This is a common cause for artificial replacement of the hip joint.

## Knee Joint

FIGURE 8.31 (p. 259-260)

1. The **knee joint** is formed by the condyles of the femur and the condyles of the tibia.
  - A. The condyles of the femur are quite round while the condyles of the tibia are slightly concave.
  - B. The connection with the tibia is made deeper by the fibrocartilage **menisci**.
2. The knee joint is unusual in that it has two internal ligaments that provide support. These are called **cruciate** (L. a cross) **ligaments** because they cross each other.
  - A. The anterior cruciate ligament extends from the femur to attach to the tibia anteriorly. It prevents anterior movement (hyperextension) of the tibia. For example, the anterior cruciate ligament prevents hyperextension of the leg when kicking a football.
  - B. The posterior cruciate ligament extends from the femur to attach to the tibia posteriorly. It prevents posterior movement of the tibia, or to look at it another way, anterior movement of the femur. For example, the posterior cruciate prevents the femur from sliding off the tibia while skiing.

☞ Crash McBang hurt his knee in an auto accident by ramming the knee into the dashboard. The doctor tested for ligament damage by having Crash sit on the edge of a table with his knee flexed at a fifteen degree angle. The doctor then performed the anterior drawer test by pulling the tibia anteriorly. Next, with the knee flexed at a ninety degree angle, the doctor performed the posterior drawer test by pushing the tibia posteriorly. There was no unusual movement of the tibia in the anterior drawer test, but there was in the posterior drawer test. Explain the purpose of each test and determine which cruciate ligament is damaged.
3. The knee joint is supported by the joint capsule and a number of surrounding ligaments, e.g. the fibular collateral ligament and the tibial collateral ligament. When the leg is extended these ligaments prevent abduction and adduction of the leg.
4. The **three C's of a knee injury** are the collateral ligament, cartilage (meniscus), and cruciate ligament.
  - A. A common type of injury to the knee results from a lateral blow to the knee. This often occurs in football, especially if the player is "clipped." Thus "clipping" is strictly illegal.

B. When a player is "clipped" the medial collateral ligament is torn. Because the medial collateral ligament is attached to the medial meniscus, the medial meniscus can also be damaged. In severe injuries, the anterior cruciate ligament is also torn.

☞ Which drawer test would be abnormal with this type of injury?

C. The lateral collateral ligament is not commonly torn because a blow to the medial side of the knee is uncommon. In addition, the lateral collateral ligament is not attached to the lateral meniscus.

4. The knee joint is traditionally classified as a hinge joint and allows flexion/extension of the leg. It is actually a complex ellipsoid joint that also allows a small amount of rotation of the leg.

5. Bursae of the knee.

A. The knee and its associated muscles have 13 bursae.

B. Bursitis of the subcutaneous prepatellar bursa can produce "housemaids knee" and bursitis of the subcutaneous infrapatellar bursa can produce "clergyman's knee." Accumulation of synovial fluid in the bursae and/or joint cavity is sometimes called "water on the knees."

☞ Prolonged kneeling can cause "housemaid's or clergyman's knees". How can kneeling result in two different disorders?

C. The infrapatellar fat pad separates the patellar ligament from the synovial membrane of the knee and functions much like a bursa. Reduction in the amount of fat or irritation of the fat pad can produce "fat pad syndrome."

6. The patella forms a plane joint with the patellar groove of the femur, allowing the patella to slide within the patellar groove.

A. The patella is contained within the tendon of the quadriceps femoris muscle. The patellar ligament attaches the patella to the tibial tuberosity. The patella acts as a lever to increase the power of the quadriceps muscle and protects the muscle tendon from erosion by the femoral bone.

B. Improper tracking of the patella within the patellar groove can produce patellofemoral pain and possibly chondromalacia (softening of the cartilage). Popularly called "runner's knee" because it is common in runners.

7. Other disorders of the knee include osteoarthritis, rheumatoid arthritis, and tendonitis.

## Ankle Joint

FIGURE 8.32

1. The **ankle joint** is formed by the distal end and medial malleolus of the tibia, the lateral malleolus of the fibula, and the talus.
  2. The ankle joint is classified as a hinge joint but is actually a modified ball-and-socket joint that allows dorsiflexion/plantar flexion and inversion/eversion of the foot.
  3. The ankle joint is supported by a joint capsule and surrounding ligaments.
  4. A sprain results in partially or completely torn ligaments. When the foot is inverted, the calcaneofibular ligament usually tears first, followed by the anterior talofibular ligament.
- ☞ Do sprains most commonly occur because of too much inversion or eversion of the foot? Explain.

## Arches of the Foot

FIGURE 7.44

1. The foot has three **arches** formed by the bones of the foot. The three arches are the medial longitudinal arch, the lateral longitudinal arch, and the transverse arch.
2. The arches function to transfer weight from the calcaneus. When the foot is placed down, weight is transferred from the tibia and the fibula to the talus. From the talus the weight is transferred to the calcaneus. The arch system transfers the weight from the calcaneus to the heads of the metatarsals.
3. The shape of the arches is maintained by the bones of the arches (like bricks in an archway) and by plantar ligaments and muscles.
4. If the arches fail to develop correctly, or if the ligaments and muscles supporting the arch are stretched, flat feet can result.
5. The muscles of the foot are supported by connective tissue called the plantar fascia. Plantar fasciitis is inflammation of the plantar fascia. It can result from straining the plantar fascia, e.g., long distance running.

## Temporomandibular Joint

FIGURE 8.27

1. The **temporomandibular joint** is formed by the mandibular condyle and the mandibular fossa of the temporal bone. It is supported by a joint capsule and ligaments.
  - ☞ An articular disk is located in-between the condyle and the fossa. Why would you expect to find an articular disk in this location?
  
2. The temporomandibular joint is a combination plane and ellipsoid joint.
  - A. The plane joint is responsible for protraction/retraction and lateral/medial excursion of the mandible.
  - B. The ellipsoid joint in combination with the plane joint allows depression/elevation of the mandible. First the mandibular condyle rotates (ellipsoid joint) as the mandible is depressed. Then the mandibular condyle moves anteriorly (plane joint) and then rotates again (ellipsoid joint) as the mandible is further depressed. Test this by placing your fingers over the mandibular condyle while depressing the mandible.
    - ☞ The mandible can be dislocated, e.g., from extreme depression during a tooth extraction, yawning, taking a big bite, from a blow to the mandible when the mouth is open, or from placing a billiard ball in the mouth. Would you expect the mandibular condyle to end up by the zygomatic arch, the mastoid process, or would it be displaced medially/laterally? Explain.
  
2. Temporomandibular joint (TMJ) disorders.
  - A. Due to a combination of misalignment of the teeth and increased muscular contractions resulting from stress.
  - B. Treatment involves reduction of stress, devices to prevent teeth from contacting each other, and realignment of the teeth.