Lecture 15

Joint II - Anatomy and physiology of individual joints

Plan of the Lecture

1. The Jaw Joint
2. The Shoulder Joint
3. The Elbow Joint
4. The Hip Joint
5. The Knee Joint
6. The Ankle Joint

LEARNING OUTCOMES

1. identify the major anatomical features of the jaw, shoulder, elbow, hip, knee, and ankle joints;
2. explain how the anatomical differences between these joints are related to differences in function.

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The temporomandibular (jaw) joint (TMJ) is the articulation of the condyle of the mandible with the mandibular fossa of the temporal bone. You can feel its action by pressing your fingertips against the jaw immediately anterior to the ear while opening and closing your mouth. The synovial cavity of the TMJ is divided into superior and inferior chambers by an articular disc, which permits lateral and medial excursion of the mandible. Two ligaments support the joint. The lateral ligament prevents posterior displacement of the mandible. If the jaw receives a hard blow, this ligament normally prevents the condylar process from being driven upward and fracturing the base of the skull. The sphenomandibular ligament on the medial side of the joint extends from the sphenoid bone to the ramus of the mandible. A stylomandibular ligament extends from the styloid process to the angle of the mandible but is not part of the TMJ proper. The glenohumeral (humeroscapular) joint, or shoulder joint, is where the hemispherical head of the humerus articulates with the glenoid cavity of the scapula. Together, the shoulder and elbow joints serve to position the hand for the performance of a task; without a hand, shoulder and elbow movements are almost useless. The relatively loose shoulder joint capsule and shallow glenoid cavity sacrifice joint stability for freedom of movement. The cavity, however, has a ring of fibrocartilage called the glenoid labrum around its margin, making it somewhat deeper than it looks on a dried skeleton. The elbow is a hinge joint composed of two articulations: the humeroulnar joint where the trochlea of the humerus joins the trochlear notch of the ulna, and the humeroradial joint where the capitulum of the humerus meets the head of the radius. Both are enclosed in a single joint capsule. On the posterior side of the elbow, there is a prominent olecranon bursa to ease the movement of tendons over the joint. Side-to-side motions of the

elbow joint are restricted by a pair of ligaments: the radial (lateral) collateral ligament and ulnar (medial) collateral ligament. The coxal (hip) joint is the point where the head of the femur inserts into the acetabulum of the hip bone. Because the coxal joints bear much of the body's weight, they have deep sockets and are much more stable than the shoulder joint. The depth of the socket is somewhat greater than you see on dried bones because of a horseshoe shaped ring of fibrocartilage, the acetabular labrum, attached to its rim. Dislocations of the hip are rare, but some infants suffer congenital dislocations because the acetabulum is not deep enough to hold the head of the femur in place. If detected early, this condition can be treated with a harness, worn for 2 to 4 months, that holds the head of the femur in the proper position until the joint is stronger. The tibiofemoral (knee) joint is the largest and most complex diarthrosis of the body. It is primarily a hinge joint, but when the knee is flexed it is also capable of slight rotation and lateral gliding. The patella and patellar ligament also articulate with the femur to form a gliding patellofemoral joint. The joint capsule encloses only the lateral and posterior aspects of the knee joint, not the anterior. The anterior aspect is covered by the patellar ligament and the lateral and medial patellar retinacula (not illustrated). These are extensions of the tendon of the quadriceps femoris muscle, the large anterior muscle of the thigh. The knee is stabilized mainly by the quadriceps tendon in front and the tendon of the semimembranosus muscle on the rear of the thigh. Developing strength in these muscles therefore reduces the risk of knee injury. The joint cavity contains two C-shaped cartilages called the lateral and medial menisci (singular, meniscus) joined by a transverse ligament. The menisci absorb the shock of the body weight jostling up and down on the knee and prevent the femur from rocking from side to side on the tibia.

Check yourself! The questions for self-control

1. What keeps the mandibular condyle from slipping out of its fossa in a posterior direction?
2. Explain how the biceps brachii tendon braces the shoulder joint.
3. Identify the three joints found at the elbow and name the movements in which each joint is involved.
4. What keeps the femur from slipping backward off the tibia?
5. What keeps the tibia from slipping sideways off the talus?

Recommended readings:

1. Kenneth S Saladin - Anatomy & Physiology. The Unity of Form and Function (2016, McGraw-Hill Education)
2. Barbara Gylys - Medical Terminology Systems (2012, F.A. Davis Company)
3. Richard L. Drake A. Wayne Vogl, Adam W. M. Mitchell - Gray's Atlas of Anatomy, Second Edition (2015, Churchill Livingstone Elsevier)