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## Joints Part B

### **Types of Synovial Joints**

- Plane joints
  - Articular surfaces are essentially flat
  - Allow only slipping or gliding movements
  - Only examples of nonaxial joints

### **Types of Synovial Joints**

- Hinge joints
  - Cylindrical projections of one bone fits into a trough-shaped surface on another
  - Motion is along a single plane
  - Uniaxial joints permit flexion and extension only
  - Examples: elbow and interphalangeal joints

### **Types of Synovial Joints**

#### **Pivot Joints**

- Rounded end of one bone protrudes into a “sleeve,” or ring, composed of bone (and possibly ligaments) of another
- Only uniaxial movement allowed
- Examples: joint between the axis and the dens, and the proximal radioulnar joint

#### **Pivot Joints**

#### **Condyloid, or Ellipsoidal, Joints**

- Oval articular surface of one bone fits into a complementary depression in another
- Both articular surfaces are oval
- Biaxial joints permit all angular motions
- Examples: radiocarpal (wrist) joints, and metacarpophalangeal (knuckle) joints

#### **Condyloid, or Ellipsoidal, Joints**

#### **Saddle Joints**

- Similar to condyloid joints but allow greater movement
- Each articular surface has both a concave and a convex surface

- Example: carpometacarpal joint of the thumb

### **Saddle Joints**

### **Ball-and-Socket Joints**

- A spherical or hemispherical head of one bone articulates with a cuplike socket of another
- Multiaxial joints permit the most freely moving synovial joints
- Examples: shoulder and hip joints

### **Ball-and-Socket Joints**

### **Synovial Joints: Knee**

- Largest and most complex joint of the body
- Allows flexion, extension, and some rotation
- Three joints in one surrounded by a single joint cavity
  - Femoropatellar
  - Lateral and medial tibiofemoral joints

### **Synovial Joints: Knee Ligaments and Tendons – Anterior View**

- Tendon of the quadriceps femoris muscle
- Lateral and medial patellar retinacula
- Fibular and tibial collateral ligaments
- Patellar ligament

### **Synovial Joints: Knee –**

### **Other Supporting Structures**

- Anterior cruciate ligament
- Posterior cruciate ligament
- Medial meniscus (semilunar cartilage)
- Lateral meniscus

### **Synovial Joints: Knee –**

### **Other Supporting Structures**

### **Synovial Joints: Knee –**

### **Posterior Superficial View**

- Adductor magnus tendon
- Articular capsule
- Oblique popliteal ligament
- Arcuate popliteal ligament
- Semimembranosus tendon

### **Synovial Joints: Shoulder (Glenohumeral)**

- Ball-and-socket joint in which stability is sacrificed to obtain greater freedom of movement
- Head of humerus articulates with the glenoid fossa of the scapula

## **Synovial Joints: Shoulder Stability**

- Weak stability is maintained by:
  - Thin, loose joint capsule
  - Four ligaments – coracohumeral, and three glenohumeral
  - Tendon of the long head of biceps, which travels through the intertubercular groove and secures the humerus to the glenoid cavity
  - Rotator cuff (four tendons) that encircles the shoulder joint and blends with the articular capsule

## **Synovial Joints: Shoulder Stability**

## **Synovial Joints: Shoulder Stability**

## **Synovial Joints: Hip (Coxal) Joint**

- Ball-and-socket joint
- Head of the femur articulates with the acetabulum
- Good range of motion, but limited by the deep socket and strong ligaments

## **Synovial Joints: Hip Stability**

- Acetabular labrum
- Iliofemoral ligament
- Pubofemoral ligament
- Ischiofemoral ligament
- Ligamentum teres

## **Synovial Joints: Hip Stability**

## **Synovial Joints: Elbow**

- Hinge joint that allows flexion and extension only
- Radius and ulna articulate with the humerus

## **Synovial Joints: Elbow Stability**

- Annular ligament
- Ulnar collateral ligament
- Radial collateral ligament

## **Synovial Joints: Elbow Stability**

## **Sprains**

- The ligaments reinforcing a joint are stretched or torn
- Partially torn ligaments slowly repair themselves
- Completely torn ligaments require prompt surgical repair

## **Cartilage Injuries**

- The snap and pop of overstressed cartilage
- Common aerobics injury

- Repaired with arthroscopic surgery

### **Dislocations**

- Occur when bones are forced out of alignment
- Usually accompanied by sprains, inflammation, and joint immobilization
- Caused by serious falls and are common sports injuries
- Subluxation – partial dislocation of a joint

### **Inflammatory and Degenerative Conditions**

- Bursitis
  - An inflammation of a bursa, usually caused by a blow or friction
  - Symptoms are pain and swelling
  - Treated with anti-inflammatory drugs; excessive fluid may be aspirated
- Tendonitis
  - Inflammation of tendon sheaths typically caused by overuse
  - Symptoms and treatment are similar to bursitis

### **Arthritis**

- More than 100 different types of inflammatory or degenerative diseases that damage the joints
- Most widespread crippling disease in the U.S.
- Symptoms – pain, stiffness, and swelling of a joint
- Acute forms are caused by bacteria and are treated with antibiotics
- Chronic forms include osteoarthritis, rheumatoid arthritis, and gouty arthritis

### **Osteoarthritis (OA)**

- Most common chronic arthritis; often called “wear-and-tear” arthritis
- Affects women more than men
- 85% of all Americans develop OA
- More prevalent in the aged, and is probably related to the normal aging process

### **Osteoarthritis: Course**

- OA reflects the years of abrasion and compression causing increased production of metalloproteinase enzymes that break down cartilage
- As one ages, cartilage is destroyed more quickly than it is replaced
- The exposed bone ends thicken, enlarge, form bone spurs, and restrict movement
- Joints most affected are the cervical and lumbar spine, fingers, knuckles, knees, and hips

### **Osteoarthritis: Treatments**

- OA is slow and irreversible
- Treatments include:
  - Mild pain relievers, along with moderate activity
  - Magnetic therapy
  - Glucosamine sulfate decreases pain and inflammation

### **Rheumatoid Arthritis (RA)**

- Chronic, inflammatory, autoimmune disease of unknown cause, with an insidious onset
- Usually arises between the ages of 40 to 50, but may occur at any age
- Signs and symptoms include joint tenderness, anemia, osteoporosis, muscle atrophy, and cardiovascular problems
  - The course of RA is marked with exacerbations and remissions

### **Rheumatoid Arthritis: Course**

- RA begins with synovitis of the affected joint
- Inflammatory chemicals are inappropriately released
- Inflammatory blood cells migrate to the joint, causing swelling
- Inflamed synovial membrane thickens into a pannus
- Pannus erodes cartilage, scar tissue forms, articulating bone ends connect
- The end result, ankylosis, produces bent, deformed fingers

### **Rheumatoid Arthritis: Treatment**

- Conservative therapy – aspirin, long-term use of antibiotics, and physical therapy
- Progressive treatment – anti-inflammatory drugs or immunosuppressants
- The drug Enbrel, a biological response modifier, neutralizes the harmful properties of inflammatory chemicals

### **Gouty Arthritis**

- Deposition of uric acid crystals in joints and soft tissues, followed by an inflammation response
- Typically, gouty arthritis affects the joint at the base of the great toe
- In untreated gouty arthritis, the bone ends fuse and immobilize the joint
- Treatment – colchicine, nonsteroidal anti-inflammatory drugs, and glucocorticoids

### **Developmental Aspects of Joints**

- By embryonic week 8, synovial joints resemble adult joints

- Few problems occur until late middle age
- Advancing years take their toll on joints:
  - Ligaments and tendons shorten and weaken
  - Intervertebral discs become more likely to herniate
  - Most people in their 70s have some degree of OA
- Prudent exercise (especially swimming) that coaxes joints through their full range of motion is key to postponing joint problems