

Articulations and Movement

Chapter 8

Definition: A **joint** or **articulation** is a place in the body where two bones come together.

CLASSES OF JOINTS.

1. Joints are classified according to how the bones are held together.
2. The three types of joints are fibrous, cartilaginous, and synovial.

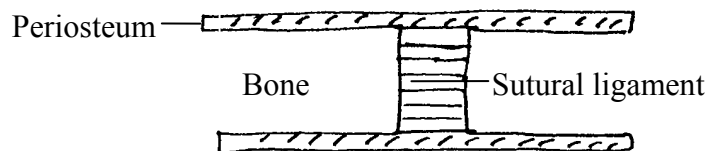
Fibrous Joints

1. The bones are held together by fibrous connective tissue and exhibit little or no movement.
2. The three types of fibrous joints are sutures, syndesmoses, and gomphoses.

Sutures

1. **Sutures** are fibrous joints between the bones of the skull. The bones are close together and bound together by **sutural ligaments**. In adults, some sutures allow no movement between the bones.

FIGURE 8.1



2. In the newborn, the sutures are fairly wide. In some locations, they are very large and are called **fontanels**. This allows the skull to "give" during delivery. The frontal bone and mandible are divided by a suture.

FIGURE 8.2

3. A **synostosis** occurs when two bones grow together across a joint to form a single bone.
 - A. This normally occurs around two years of age for the mandible and the frontal bone.
 - B. Around forty years of age (there is great variability) other sutures begin to fuse.

☞ Name a place in the body (other than the skull) where a synostosis occurs?

☞ What shape would the skull be if the sagittal suture fused prematurely before growth of the skull was completed?

Syndesmoses

1. A **syndesmosis** is a fibrous joint that is held together by longer fibers than a suture and some movement can occur.
2. The membrane between the radius and ulna is an example

FIGURE 8.3

Gomphoses

1. A **gomphoses** is a bony peg than fits into a socket. The bony peg connects to the socket by ligaments that allow slight movement or "give."
2. The teeth fitting into the mandible or maxillae are gomphoses. The teeth are held in place by **periodontal ligaments**. Periodontal, or gum, disease is the breakdown of the periodontal ligaments and loss of teeth.

FIGURE 8.4

Cartilaginous Joints

1. **Cartilaginous joints** are held together by cartilage.
2. The two types of cartilaginous joints are synchondroses and symphyses.

Synchondroses

1. A **synchondrosis** is bones joined by hyaline cartilage.
 - A. Most synchondroses allow little movement and eventually become synostoses.
 - 1) Epiphyseal plate.
 - 2) Between the bones (ilium, ischium and pubis) of the coxa.

FIGURE 8.5

- B. Some synchondroses allow movement and do not become synostoses, e.g., between the first rib and the sternum.

Symphysis

1. A **symphysis** is bones united by fibrocartilage and is slightly movable. Fibrocartilage contains bundles of collagen fibers and can withstand lots of pressure.
2. An example is the symphysis pubis which joins the coxae (hip bones) together.

FIGURE 8.6

☞ Can you think of another place in the body where a symphysis joint occurs?

Synovial Joints

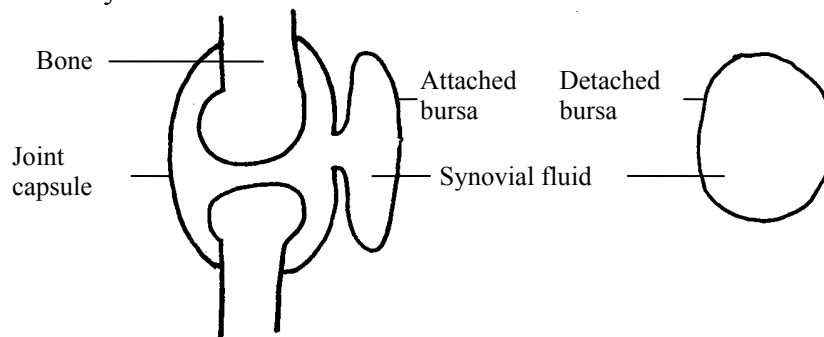
1. **Synovial joints** contain synovial fluid and allow considerable movement.

FIGURE 8.7

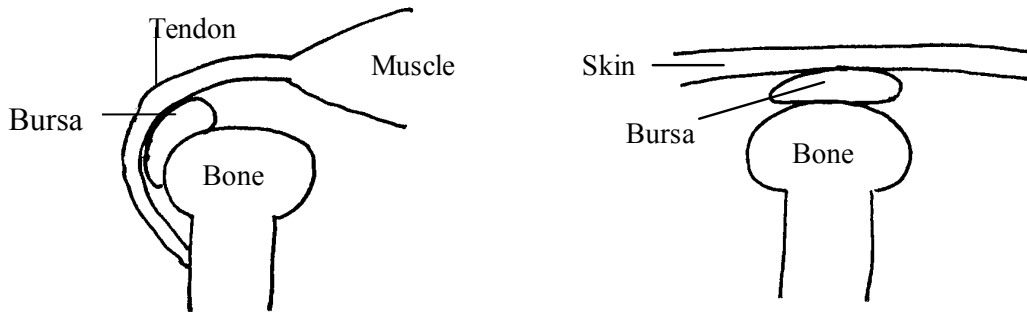
2. Components of a synovial joint.
 - A. A **joint capsule** that consists of two layers.
 - 1) The **fibrous capsule** holds the ends of the bones together and allows movement of the joint.
 - 2) The **synovial membrane** which consists of connective tissue.
 - B. **Synovial fluid** is a combination of materials filtered from blood and secreted by the cells of the synovial membrane. It contains hyaluronic acid, which makes the fluid very slippery. Synovial fluid acts as a lubricant to reduce friction within the joint.
 - C. **Articular (hyaline) cartilage** covers the ends of the bones. It is very smooth and resilient.
 - D. The **joint cavity** is a small space bounded by the synovial membrane and the articular cartilages. It is filled with synovial fluid.
3. Structures associated with synovial joints.
 - A. An **articular disk** (also called a **meniscus** in some joints, e.g., the knee) is a fibrocartilage disk that provides additional support and/or deepens the joint cavity.

FIGURE 8.31d

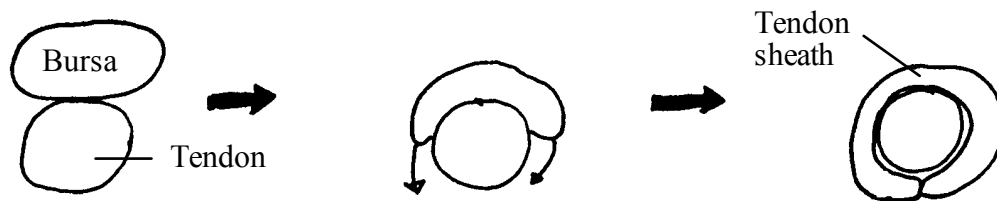
- B. A **bursa** is a synovial fluid-filled sac.
 - 1) The bursa may be connected to the joint cavity or can be completely separated from the joint cavity.



- 2) Bursa function to protect structures that would otherwise rub against each other, e.g., the tendon of a muscle against a bone or skin against bone.



- 3) **Bursitis** is inflammation of a bursa. It can cause pain and limit movement around a joint.
- 4) If the bursa extends along and around the tendon for some distance it is called a **tendon sheath**.



Types of Synovial Joints

1. Synovial joints permit three kinds of movements.
 - A. **Monoaxial** movements occur around one axis.
 - B. **Biaxial** movements occur about two axis that are at right angles to each other.
 - C. **Multiaxial** movements occur about several axes.
2. The six kinds of synovial joints are classified according to the shape of the bones forming the joint.

FIGURES 8.8 - 8.13

- A. A **plane** or **gliding joint** consists of two flat surfaces that slide past each other. Movement is monoaxial (some rotation).

B. A **saddle joint** consists of two saddle-shaped surfaces. Movement is biaxial.



C. A **hinge joint** consists of a convex surface inserted into a concave surface. Movement is monoaxial.

D. A **pivot joint** consists of a cylindrical bony process that rotates within a ring of bone and ligament. Movement is monoaxial, that is, rotation.

E. A **ball-and-socket joint** consists of a ball (head) inserted into a socket. Movement is multiaxial allowing movement in almost any direction.

F. An **ellipsoid joint** is a modified ball-and-socket joint that limits movement mostly to two planes. Movement is biaxial.

TYPES OF MOVEMENTS

1. With few exceptions, movements are described in relation to the anatomic position.
2. Movements are usually considered in pairs: movement away from the anatomic position and movement back to the original position.

FIGURES 8.14 - 8.26

Gliding Movements

1. Two flat, or nearly flat surfaces slide past each other.
2. Occurs in plane joints.

Angular Movements

2. Angular movements involve changing the angle between two parts of the body.
3. **Flexion** means to bend (decrease the angle) and **extension** means to straighten (increase the angle).
 - A. The definitions of flexion and extension make sense when applied to the elbow and knee. For other joints it gets so confusing it is not worth learning alternative definitions.
 - 1) Just learn the movements and use this rule: flexion movements are necessary to achieve the fetal position.
 - 2) **Plantar flexion** (stand on one's toes) and **dorsiflexion** (stand on one's heels).
 - B. **Hyperextension** is an abnormal, forced extension that often results in damage.

4. **Abduction** (to take away) is movement away from the midline and **adduction** (to bring together) is movement toward the midline.

Circular Movements

1. **Rotation** is movement of a structure around its long axis.
2. **Pronation** turns the palm posteriorly and **supination** turns the palm anteriorly (hint: the movement made when eating soup).
3. **Circumduction** is movement that produces a cone.

Special Movements

1. **Elevation** moves superiorly and **depression** moves inferiorly.
 2. **Protraction** moves anteriorly in a horizontal line and **retraction** moves posteriorly in a horizontal line.
 3. **Lateral excursion** moves the mandible to the right or left of the midline and **medial excursion** moves the mandible to the midline.
 4. **Opposition** touches the thumb and little finger and **reposition** returns thumb and little finger to the anatomical position.
 5. **Inversion** moves the plantar surface of the foot medially and **eversion** moves the plantar surface of the foot laterally. Inversion of the foot is sometimes called supination and eversion of the foot is sometimes called pronation.
 6. **Combination movements** are any of the movements listed above used together to accomplish a movement.
- ☞ What combination of movements is required to move the hand from the anatomical position so that it touches the head?

- ☞ For each joint, indicate the type of joint and the type of movements that can occur at that joint.

<u>Joint</u>	<u>Type of Joint</u>	<u>Type of Movement</u>
1. Between phalanges		
2. Between phalanx and metacarpal		
3. Between carpals and radius		
4. Between head of radius and ulna		
5. Between articular processes of vertebra		
6. Hip		
7. Knee		
8. Ankle		

Range of Motion

1. **Range of motion** is the amount of movement possible in a joint.
 - A. **Active range of motion** is the amount of movement of a joint caused by muscles.
Passive range of motion is the amount of movement of a joint caused by an outside force.
 - B. Normally, active range and passive range of motion are about equal.