CLASSIFICATIONS OF JOINTS

Khaleel Alyahya, PhD, MEd
www.khaleelalyahya.net
Resources

Essential of Human Anatomy & Physiology
By Elaine Marieb and Suzanne Keller

Atlas of Human Anatomy

By Frank Netter

Gray's Anatomy
By Richard Drake, Wayne Vogl & Adam Mitchell

www.kenhub.com

KENHUB
Introduction

- Joints are the location where two or more bones come together to create body movement or articulation.

- There are three types of joints classified according to whether they move a lot, a little, or not at all:
  - Fibrous
  - Cartilaginous
  - Synovial

- Also, joints can be classified based on the number of bones involved, and into complex and combination joints:
  - Simple joint:
    - two articulation surfaces (shoulder and hip joints)
  - Compound joint:
    - three or more articulation surfaces (radiocarpal joint)
  - Complex joint:
    - two or more articulation surfaces and an articular disc or meniscus (knee joint)
Definition

- Joints are the location where two or more bones come together to create body movement or articulation.
- Most joints are mobile, allowing the bones to move.
- Joints consist of the following:
  - Cartilage
  - Synovial membrane
  - Synovial fluid
  - Ligaments
  - Tendons
  - Bursae
  - Meniscus
Composition

- **Cartilage**
  - This is a type of tissue that covers the surface of a bone at a joint.
  - Cartilage helps reduce the friction of movement within a joint.

- **Synovial membrane**
  - A tissue called the synovial membrane lines the joint and seals it into a joint capsule.
  - The synovial membrane secretes a clear, sticky fluid (synovial fluid) around the joint to lubricate it.

- **Synovial fluid**
  - A clear, sticky fluid secreted by the synovial membrane.

- **Ligaments**
  - Strong ligaments (tough, elastic bands of connective tissue) surround the joint to give support and limit the joint's movement.
  - Ligaments connect bones together.

- **Tendons**
  - Tendons (another type of tough connective tissue) on each side of a joint attach to muscles that control movement of the joint.
  - Tendons connect muscles to bones.

- **Bursae**
  - Fluid-filled sacs, called bursas, between bones, ligaments, or other nearby structures.
  - They help cushion the friction in a joint.

- **Meniscus**
  - This is a curved part of cartilage in the knees and other joints.
Fibrous Joints

- Fibrous joints are fixed and unable to move because thick membranous collagen fibers hold the bones together.

- This type of joint is found in the skull where the coronal suture joins the frontal and parietal bones; the sagittal suture joins the two parietal bones from the front to the back and the lambdoid suture joins the parietal bones with the occipital bone.

- Examples:
  - **Skull sutures**: No movement
  - **Inferior tibiofibular joints**: very Little movement, permanent joints.
  - **Gomphoses**: Between teeth and their socket.
Cartilaginous Joints

- **Cartilaginous joints** have cartilage between them.
- Although they allow movement, this is far more restricted than the movement of synovial joints.
- The joints of the vertebral column and the pelvis are examples of this type of joint.

**Primary Cartilaginous**
- The bones are united by a plate or a bar of hyaline cartilage.
- No movement, temporary joints.
- **Example:**
  - Between the Epiphysis and Diaphysis of a growing bone.
  - Between the First Rib and the Sternum (1st sternocostal joint).

**Secondary Cartilaginous**
- The bones are united by a plate of fibrocartilage.
- Little movement, permanent joints.
- They are called Midline joints.
- **Example:**
  - Joints between the Vertebral Bodies (intervertebral discs).
  - Symphysis Pubis
Synovial Joints

- **Synovial joints** permit the greatest range of movement.
- In between the bones are spaces covered with synovial membrane, which fill with synovial fluid.
- This fluid lubricates and protects the bones as they move.
- The articular surfaces are covered by a thin layer of hyaline cartilage (articular cartilage).
- A joint cavity enclosed within the capsule.
- A thin vascular synovial membrane lining the inner surface of the capsule.
- A lubricating synovial fluid produced by synovial membrane in the joint cavity.
- The fluid minimizes the friction between the articular surfaces.
Classifications of Synovial Joints

- Synovial joints permit the greatest range of movement.
- According to the range of movement synovial joints are classified into:

  - **Plane Synovial Joints**
    - The articulating surfaces are flat.
    - The bones slide on one another, producing a gliding movement.
    - Examples:
      - Intercarpal Joints
      - Sternoclavicular joint
      - Acromioclavicular joint

  - **Axial Synovial Joints**
    - Movements occur along an axes:
      - Transverse axis: flexion & extension.
      - Longitudinal axis: rotation.
      - Antero-posterior axis: abduction & adduction.
    - Axial joints are divided into:
      - Uniaxial.
      - Biaxial.
      - Multi-axial or (polyaxial).
Uniaxial Synovial Joints

- **Hinge joints**
  - Axis: transverse.
  - Movements: flexion & extension.
  - Example: elbow joint and ankle joint.

- **Pivot joints**
  - Axis: longitudinal.
  - Movements: rotation.
  - Example: radio-ulnar and atlantoaxial joint.
    - A joint in the upper part of the neck between the first and second cervical vertebrae; the atlas and axis
Biaxial Synovial Joints

- **Ellipsoid joints:**
  - An elliptical convex fits into an elliptical concave articular surfaces.
  - Axes: Transverse & anteroposterior.
  - Movements: flexion & extension + abduction & adduction. BUT rotation is impossible.
  - Example: Wrist joint.

- **Saddle joints**
  - The articular surfaces are reciprocally concavoconvex.
  - They resemble a saddle on a horse’s back.
  - Movement:
    - As ellipsoid joints (Flexion & extension + abduction & adduction) + a small range of rotation.
    - Example: Carpometacarpal joint of the thumb.
Polyaxial Synovial Joints

• **Ball-and-Socket joints:**
  • A ball–shaped head of a bone fits into a socket-like concavity of another.
  • Movements: Flexion & extension + abduction & adduction + medial & lateral rotation.
  • Examples:
    o Shoulder joint.
    o Hip joint.
Types of Synovial Joints

- **Pivot joint** (b/w vertebrae)
- **Ball & socket joint** (b/w hip + femur)
- **Hinge joint** (b/w humerus + ulna)
- **Condyloid joint** (b/w metacarpal + phalanx)
- **Saddle joint** (b/w metacarpal + carpal)
- **Plane joint** (b/w tarsals)
Factors Effecting Stability of Synovial Joints

- **The shape of articular surfaces:**
  - The ball and socket shape of the Hip joint is a good example of the importance of the shape of the bone, to maintain joint stability.
  - The shape of the bones forming the Knee joint has nothing to do for stability.

- **Strength of the ligaments:**
  - They prevent excessive movement in a joint.

- **Tone of the surrounding muscles:**
  - In most joints, it is the major factor controlling stability.
  - The short muscles around the shoulder joint (rotator cuff) keeps the head of the humerus in the shallow glenoid cavity.
Clinicals
Arthritis

- Arthritis is inflammation of a joint resulting in pain, swelling, and alteration to structure and function.
- There are several types of arthritis with different aetiologies.
Osteoarthritis

- Osteoarthritis is the most common form of joint inflammation (arthritis).
- It stems from heavy use of articular joints over the course of many years, which can result in the wearing away of articular cartilage.
- The changes which occur are irreversible and degenerative. This results in the decreased effectiveness of articular cartilage as a shock absorber and lubricated surface, as well as the roughened edges causing further damage.
- As a result of this degeneration, repeated friction can cause symptoms of joint pain, stiffness and discomfort.
- This condition usually affects joints that support full body weight, such as the hips and the knees.
Bursitis

- Bursitis is inflammation of a bursa (a fibrous fluid-filled sac between a tendon and bone).
- Normally, the bursa provides a slippery surface that assists movement and reduces friction.
- When a bursa becomes inflamed it results in joint pain, stiffness and swelling around the affected joint.
- Bursitis is caused by chronic overuse, trauma and infection. The most commonly affected joints are the shoulder, elbow, knee and hip.
- Treatment consists of administering NSAIDs such as ibuprofen, physiotherapy and rest as required.
- In some cases an injection of a corticosteroid into the joint is required.
Dislocation

- A dislocation (also called a luxation) is the displacement of two bones from their position where they articulate in a joint.
- It usually occurs as the result of trauma.
- Ligaments in the joint are usually injured as well.
- A subluxation is a partial dislocation.
- An x-ray is required to identify if a fracture has also occurred.
- Any dislocation needs to be reduced urgently to prevent complications such as ischaemia.
QUESTIONS?

- alkhaleel@ksu.edu.sa
- +966 11 4670811
- @khaleelya