Pr. Sayed Anwar Sayed Hasan

Lecture (9)

JOINTS

Learning objectives:
After this lecture, student should be able to:
- Know the definition and structure of the joints.
- Know the different divisions of the joints.
- Describe the fibrous joints.
- Describe the cartilaginous joints.
- Describe the synovial joints and its stability.
- Understand the role of the joints in body movements.
- Understand the definition and types of joint dislocations.

Definition: A joint, or articulation, is the location where two or more bones meet

Classification Joints are classified according to the kind of material holding the bones together and the relative freedom and kind of motion at the particular joint into the following types:

(a) Fibrous Joints. (b) Cartilagenous Joints (c) Synovial Joints.

I- Fibrous Joints

Here the bones are connected together by a fibrous tissue. Varying degrees of motion, from none to some, are possible in fibrous joints.

Subtypes of fibrous joints

1) Syndesmosis: When the bones are held together by fibrous connective tissue, the joint is referred to as a syndesmosis.

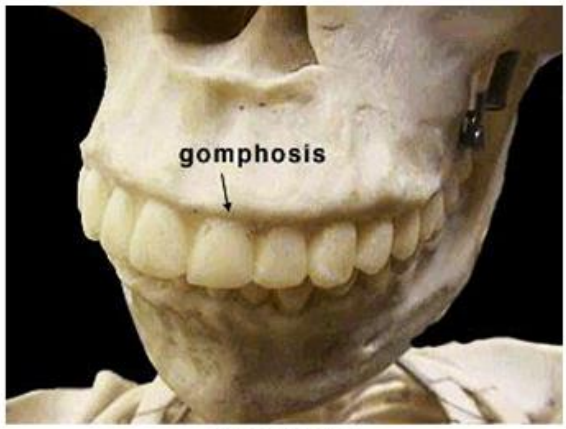
SYN=together DESMOS=fiber (a typing material)

Examples: The inferior tibio-fibular joint, the interosseous membrane connecting between the radius and ulna in the upper limb and tibia and fibula in the lower limb.

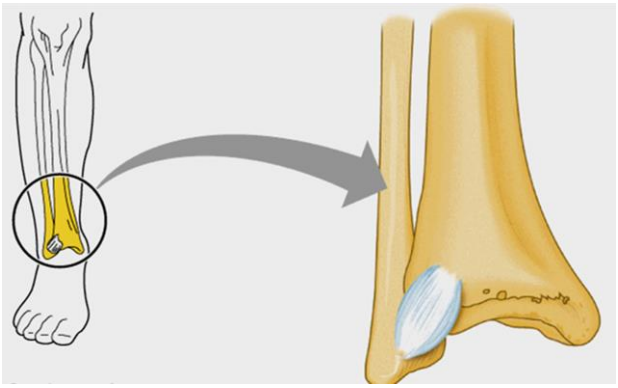
2)Sutures: When the bones are quite close together with a minimum of fibrous connective tissue, the joint is known as a suture. Example: the joints between the cranial bones (bones of the vault of the skull).

3) Gomphosis: it's the joint connecting the root of the tooth to its socket

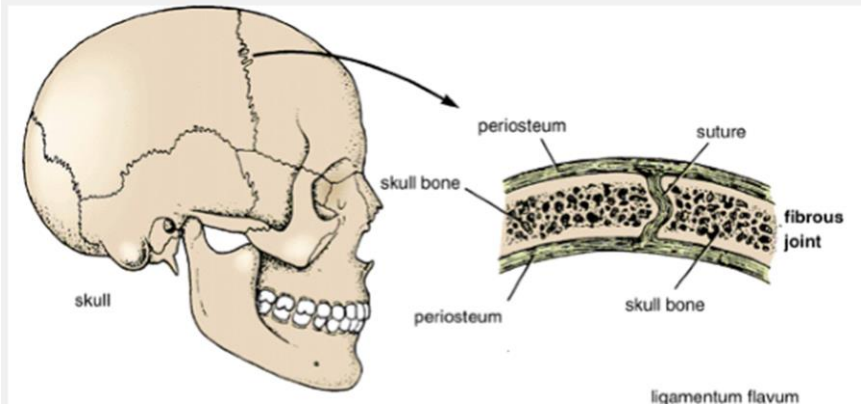
All are fibrous joints except:
A. Synchondrosis.
B. Gomphosis.
C. Sutures.
D. Syndysmosis.



Gomphosis



Syndesmosis



Fibrous joint (coronal suture of skull)

II- Cartilaginous Joints

Here the bones are bounded together by intervening cartilage and permit a limited degree of movement.

They are of two types:

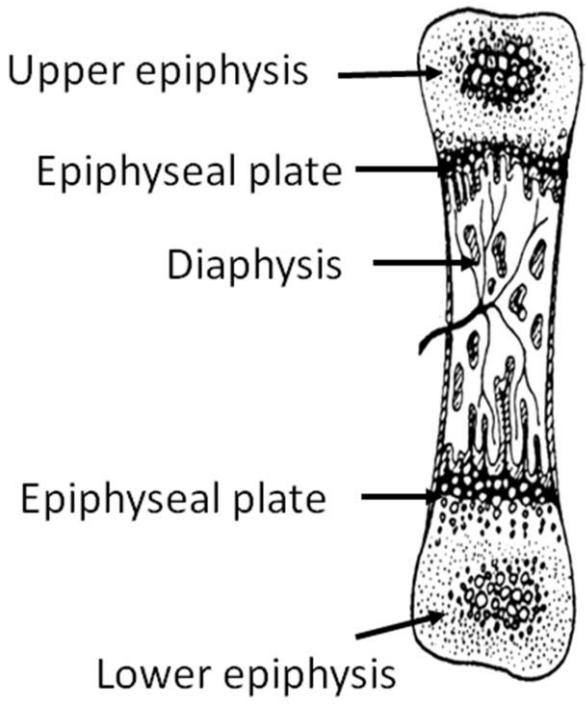
(1) Primary (Synchondrosis)

• A cartilaginous joint in which the bones are held together by a hyaline cartilage.

• SYN = together

CHONDRO = cartilage

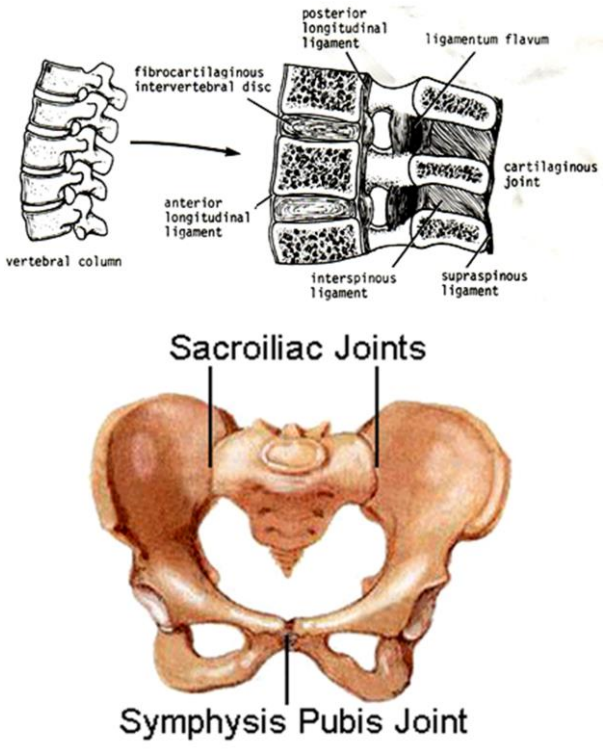
Example: Epiphyseal plate in long growing bones (synchondrosis).



Primary cartilaginous Joints

2)Secondary cartilaginous joint (Symphysis)

A joint in which the bones are held together by a fibrocartilage and the articular surfaces of the bones are covered by a thin layer of hyaline cartilage Examples: Pubic symphysis, the inter vertebral disc between bodies of vertebrae (symphyses) and manubriosternal joint (between the sternal body and the manubrium).



Secondary cartilaginous Joints

III Synovial Joints

In the synovial type of joints, the bones move on one another so as to allow various motions of the body parts. The "ovial" part of the name refers to the fact that the fluid substance seen in this type of joint appeared to the old anatomists to be like raw egg white (ovum = egg).

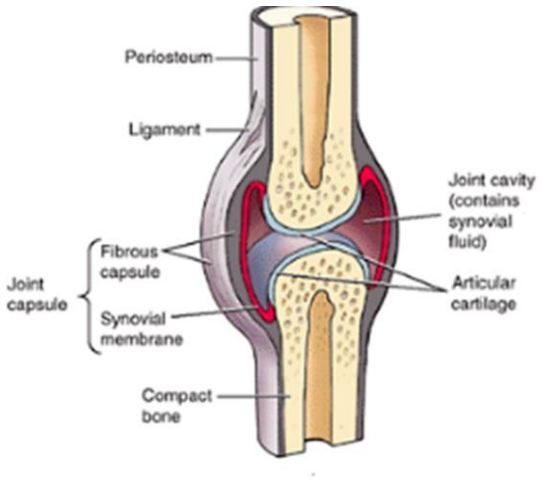
THE TYPICAL SYNOVIAL JOINT

The "typical" synovial joint has the following parts:

Structure of the synovial joint

1- Bony articular ends, which are usually large and smooth.

2- Articular cartilages: The "contact" points of the bones are usually covered with a layer of lubricated hyaline cartilage. Where these cartilages end, the synovial membranes begin. Cartilages provide a smooth surface to reduce friction.



Synovial Joint

3. **Synovial Membrane, Space, and Fluid**:

(1) Synovial membrane: The synovial membrane lines the inner surface of the capsule. It secretes synovial fluid into the synovial space.

(2) Synovial space: The space within the capsule allows movement.

(3) Synovial fluid: Synovial fluid is a colorless, viscous fluid similar in consistency to raw egg white. It lubricates the articulation.

4. **Capsule**: The "typical" synovial articulation is surrounded by a sleeve of dense fibrous connective tissue known as the capsule. The capsule encloses the articulation.

5. **Ligaments**: Primarily, ligaments hold bones together. Ligaments also may help restrain motion in certain directions and stabilize the articulation.

6. **Muscles**. Skeletal muscles apply the forces to produce given motion

Classification of Synovial Joints

Is based on shapes of articular surfaces of bones or on types of movement

I. According to the axis of movement

1.Uniaxial Synovial Joints allows movement in one plane

Examples:

(a) Plane joints.

(b) Hinge joints.

(c) Pivot joint.

2. Bi-Axial Synovial Joints allows movements in two planes

Examples:

(a) Condyloid joints.

(b)Ellipsoid joint.

(c) Saddle joint.

3. Multi-axial Synovial Joints allows movements in multiple planes

Example

Ball and socket joint.

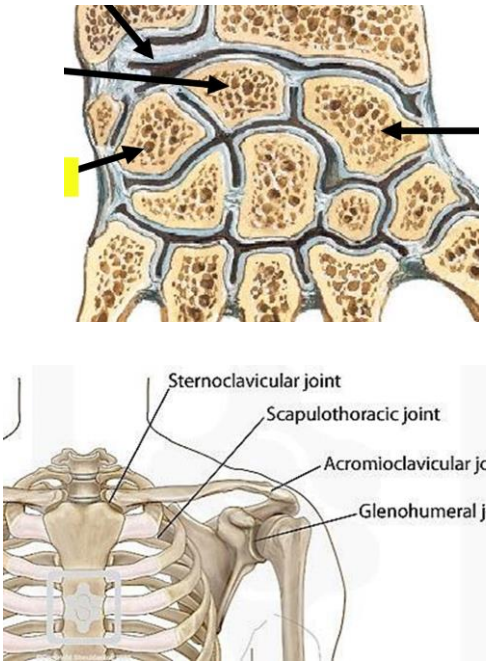
II- According to the shape of articular surfaces

Uniaxial Synovial Joints

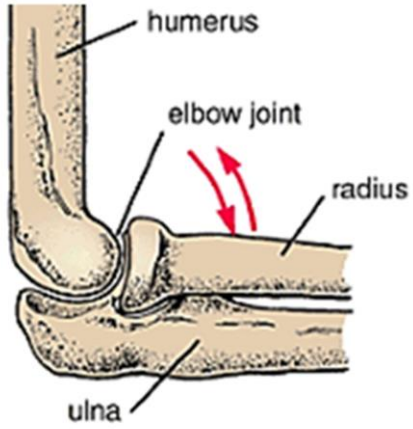
(1)Plane joints: the two articular surfaces are flat and permit only slight gliding movement. Example: intercarpal and intertarsal joints and Sternoclavicular, acromioclavicular joints

(2)Hinge joints: configuration of bones allow movement on one axis. Example: interphalangeal joints (Fingers), elbow joint and ankle joint.

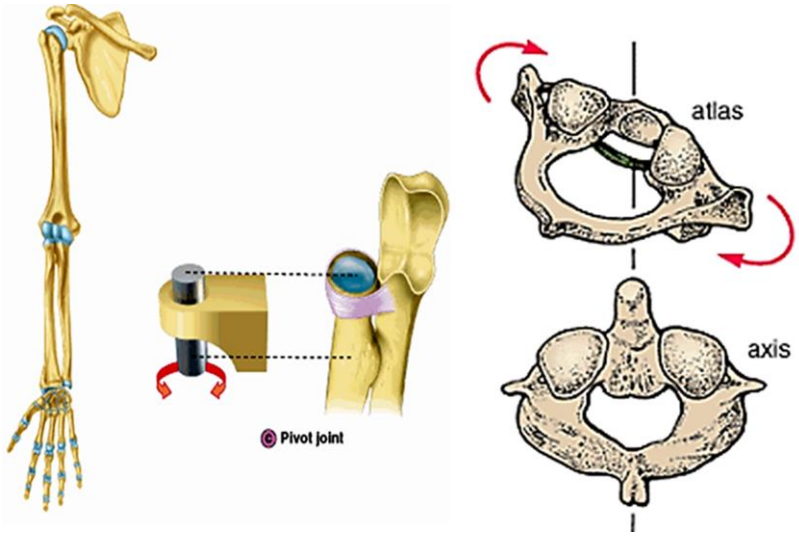
(3)Pivot joint: where one bone act as an axis and the another form a circle around this axis. In this joint either the circle rotates around the axis as the proximal radioulnar joint or the axis rotates inside the circle as the median atlantoaxial joint.



Plane synovial joints



Hinge synovial joint

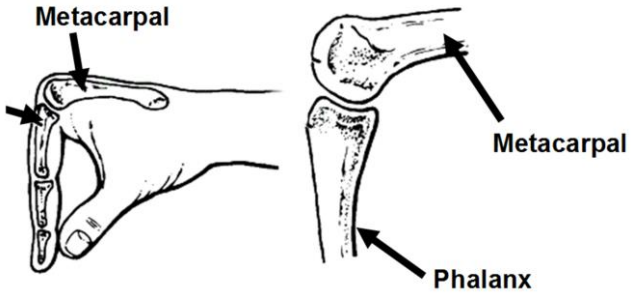


Pivot synovial joints

Bi-Axial Synovial Joints

In bi-axial synovial joints, motion between the bones occurs in two planes. Here the surface in contact is curved or rounded in two directions.

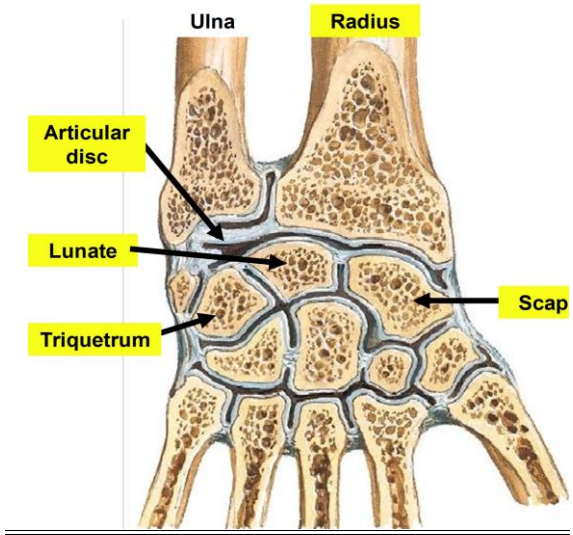
(4) Condyloid joints: The proximal phalanx of a finger can flex and extend and move from side to side on the rounded head of the metacarpal bone. This is the metacarpophalangeal joint.



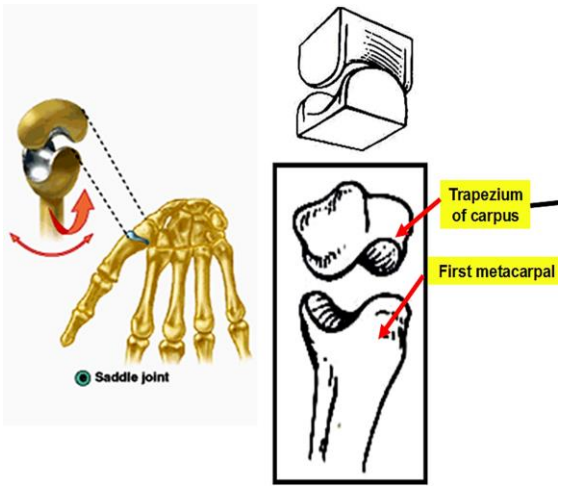
Condyloid synovial joint

(5) Ellipsoid joint: Elliptical convex surface of carpal bones articulates with elliptical concave surface of radius in the wrist joint (Radiocarpal).

(6) **Saddle joint:** one of the articular surfaces is partly convex and partly concave and the other surface are reciprocally concave convex. eg. Carpometacarpal joint of the thumb.



Ellipsoid synovial joint



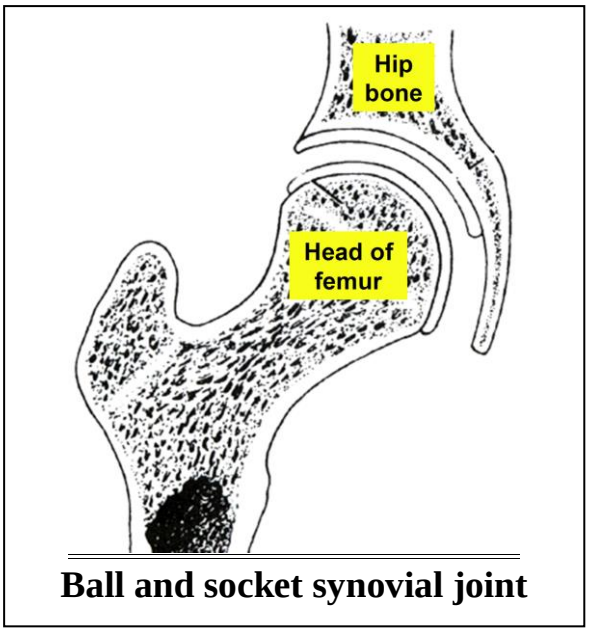
Saddle synovial joint

Multi-Axial Synovial Joints

In multi-axial joints, motion is possible in all three planes of space.

The ball-and-socket-type synovial joint

A spherically rounded head (ball-like) fits into a receiving concavity (socket). The hip joint is an example of the ball-and-socket type, with the spherical head of the femur fitting into the cup or socket (acetabulum) of the pelvic bone



Ball and socket synovial joint

Stability of joints

Any joint is stabilized by the following factors:

1 -Bony factor (the shape of articulating surfaces) example: in the hip joint the head of the femur is well adapted in the acetabulum.

2-Ligamentous factor: the strength of the fibrous capsule and the surrounding ligaments play a very important role in stability of joints as they prevent over movement and guard against sudden accidental stress.

3-Muscular factor: strong muscles surrounding a joint stabilize it.

4-Intra-articlar pressure.

Factors which limit the movements of a joint

1- Tension in the ligaments. This is apparent in attempting extension of the knee.
2- Contraction of the antagonistic muscles. In flexion of the hip while the knee is extended, flexion of the hip is limited. In flexion of the hip while the knee is flexed, the hamstring muscles are relaxed allowing more extension of the hip.
3- Increased compression between opposing articular surfaces.
4- Approximation of soft tissues. Flexion of the elbow is limited by contact of the forearm to the arm.

Choose the correct answer:

1-In……joint there is a central bony pivot surrounded by a bony-ligamentous ring.

A) Pivot. B) Saddle

c) Hing. D) Ball & socket

2-……Joints have two distinct convex surfaces that articulate with two concave surfaces.

A) Hing. B) Ball & socket

C) Ellipsoid. D) Condyloid