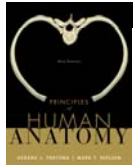


Chapter 9 Joints



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What is a 'joint'?

- The terms **joint**, **articulation**, and **arthrosis** are synonyms that refer to points of contact between two bones.
- **Arthrology** refers to the scientific study of joints.

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Joint classifications -- general points

- Classification schemes used today are based upon the structure of the joint.
- The structure of a joint includes the connecting tissues between the neighboring bones.
- Bones are either held together by
 - solid masses of connective tissue, or
 - a connective tissue capsule that surrounds a lubricated cavity.

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Joint classifications -- general points

- **Synarthroses** are joints formed by a solid mass of connective tissue between neighboring bones (*syn*= together).
 - **fibrous joints** have connective tissue masses of dense irregular connective tissue.
 - **cartilaginous joints** use some form of cartilage as the connecting tissue between the bones.

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Joint classifications -- general points

- **Diarthrooses** are movable joints whose classification is based upon the structure of the joint surfaces.
 - all share the common design feature of a joint capsule surrounding a lubricated synovial cavity.
- **Synovial** and **diarthrosis** are synonyms for capsular joints with a lubricated joint cavity.

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Ligaments

- **Ligaments** are stretch-resistant integral parts of joints composed of dense connective tissues that bind one bone to another bone.
- They serve as intrinsic binding structures of the joint itself (e.g., sutural or periodontal ligaments), or as extrinsic stabilizing bands which limit range of motion (e.g., the anterior cruciate ligament).

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Clinical terms

- The term, **sprain**, is a 'ligament' term and refers to the forcible wrenching or twisting of a joint that stretches or tears its ligaments but does not dislocate the bones.
- The term, **strain**, is a 'muscle' term and refers to the stretching or partial tearing of skeletal muscle. It often occurs when a muscle contracts suddenly and powerfully (e.g., sprinting).

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Figure 9.1 – Fibrous joints are held together by dense irregular connective tissue.

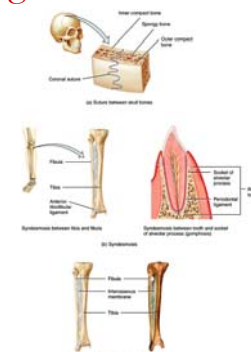


Figure 9.1: Fibrous joints are held together by dense irregular connective tissue.

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Fibrous joints.

- **Fibrous joints** are synarthroses in which the neighboring bones are joined together by a solid mass of dense irregular connective tissue.
- Examples include
 - Sutures (found only between bones of the skull)
 - Syndesmoses (found, for example, between the proximal and distal ends of the leg bones)
 - Interosseous membranes (found between the paired long bones of the forearm and leg)

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Cartilaginous joints

- **Cartilaginous joints** are synarthroses where adjacent bones are held together by a solid connective tissue mass composed of hyaline cartilage or fibrocartilage.
- These joints allow little or no movement.

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Figure 9.2 – Cartilaginous joints

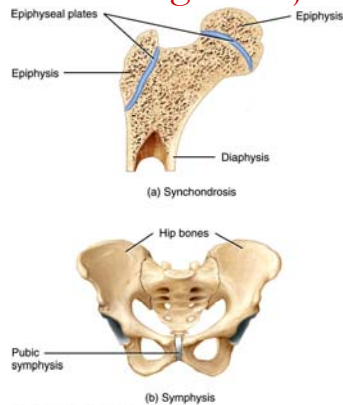


Figure 09.02 Tortora - PHA 11/e
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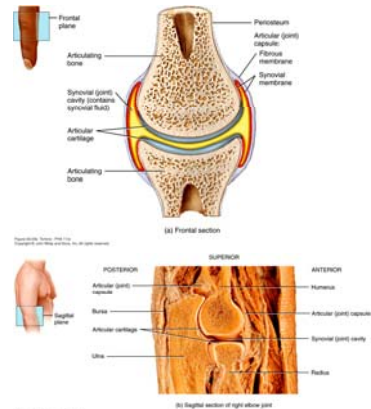
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Synovial joints

- Synovial joints are unique from other joints in that they possess a space called a **synovial (joint) cavity** that is surrounded by a connective tissue capsule that connects the articulating bones.
- Synovial joints range from slightly movable (between carpal bones) to the most mobile joints of the body (at the shoulder).

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Figure 9.3 – Synovial joint structure



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Synovial joints - Bursae

- Bursae are fluid-filled saclike structures designed to reduce friction between adjacent tissues (e.g., synovial joints) which can create considerable friction.
- Tendon (synovial) sheaths are tubular-shaped bursae.

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Types of synovial joints

- The shapes of the articulating surfaces vary. This variation in shape governs the range and type of movements possible.
 - Planar joints
 - Hinge joints
 - Pivot joints
 - Condyloid joints
 - Saddle joints
 - Ball and socket joints

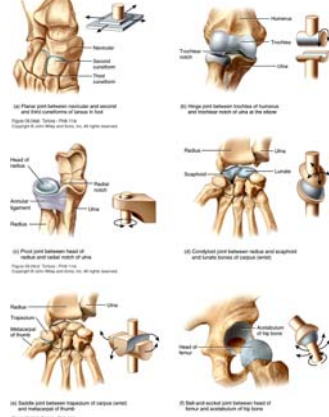
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Types of movements at synovial joints

- Gliding: limited in range of movement
- Angular: characterized by a change in the angle between articulating bones.
 - Flexion / Extension (opposite movements usually in a sagittal plane)
 - Lateral flexion (movement between intervertebral joints; usually in the frontal plane)
 - Hyperextension (extension past the anatomical plane)
 - Abduction / Adduction (opposite movements usually in a frontal plane)
 - Circumduction (movement of the distal end of a body part in a circle)

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Figure 9.4 – Types of synovial joints



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Figure 9.5 – Gliding movements



Intercarpal joints

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Figure 9.6 – Some angular movements involve a change in the angle between articulating bones.

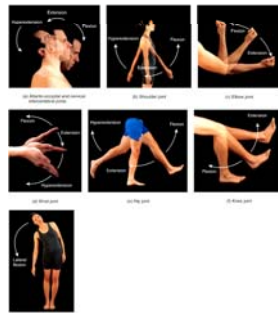


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Figure 9.7 – Some angular movements involve movement towards or away from the midline.

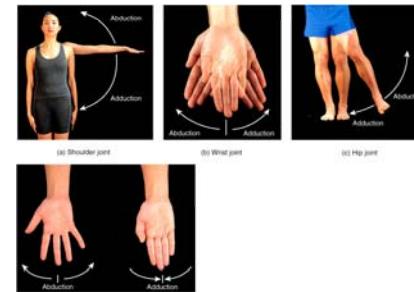
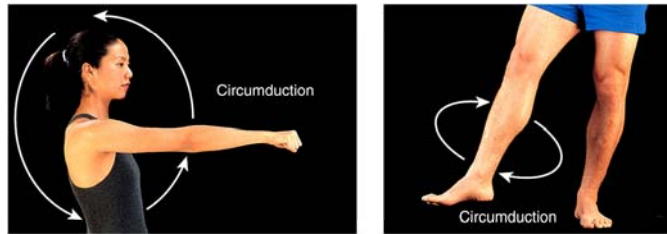


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Figure 9.8 – Circumduction is a complex angular movement.



(a) Shoulder joint

(b) Hip joint

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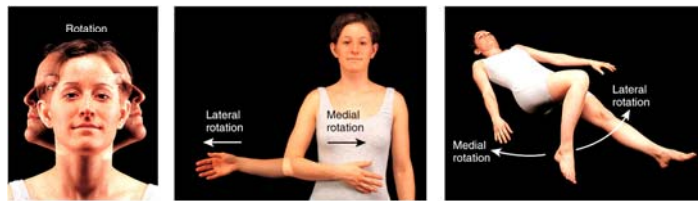
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Types of movements at synovial joints

- Rotation: a bone revolves around its own longitudinal axis.
- Special movements; most are opposites.
 - Elevation / Depression
 - Protraction / Retraction
 - Inversion / Eversion
 - Dorsiflexion / Plantar flexion
 - Supination / Pronation
 - Opposition

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Figure 9.9 – Rotational movements



(a) Atlanto-axial joint

(b) Shoulder joint

(c) Hip joint

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Figure 9.10 – Special movements

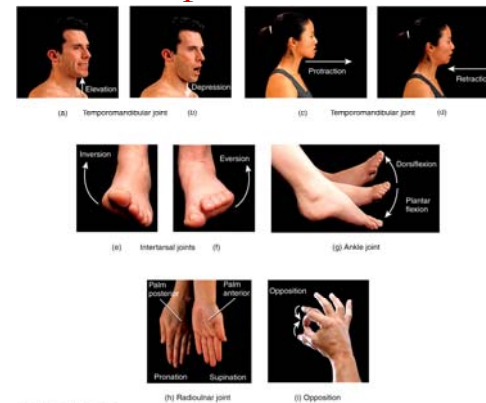


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Factors affecting contact and range of motion at synovial joints

- Structure of the articulating surfaces
- Strength and tension of joint ligaments
- Arrangement and tension of muscles
- Contact of soft parts
- Hormones
- Disuse

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Selected joints of the body

- Temporomandibular joint (TMJ)
- Shoulder joint
- Elbow joint
- Hip joint
- Knee joint
- Ankle joint

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Figure 9.11 – The temporomandibular joint (TMJ) is the only moveable joint in the skull.

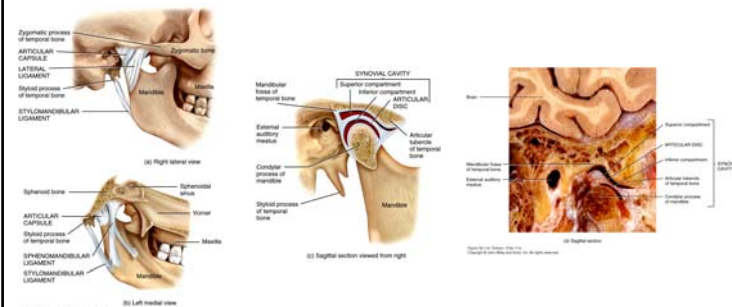


Figure 9.11: (a) Right lateral view, (b) Left medial view, (c) Sagittal section viewed from right, (d) Sagittal section.

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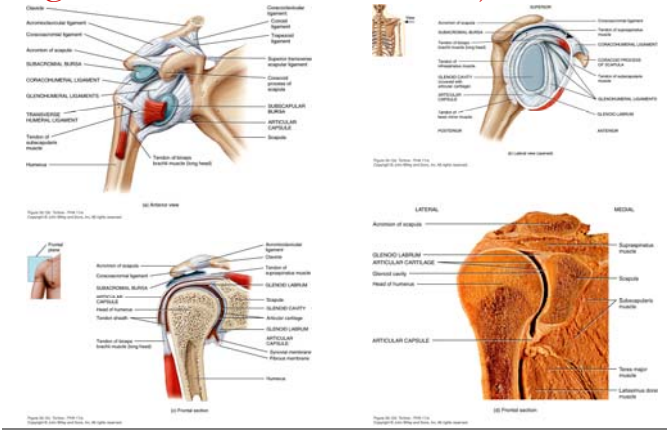
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Temporomandibular joint (TMJ)

- This is the only moveable joint of the skull.
- It is formed from the condylar process, & the mandibular fossa and articular tubercle.
- Anatomical components
 - Articular disc
 - Articular capsule
 - Lateral ligament
 - Sphenomandibular ligament
- Movements
 - Elevation / Depression
 - Protraction / Retraction

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Figure 9.12 – The shoulder joint.



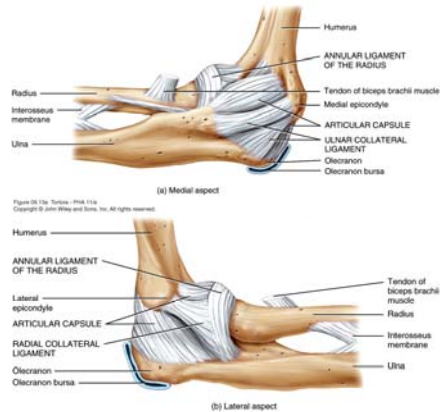
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Shoulder joint: a ball & socket joint

- It is formed from the head of the humerus and the glenoid cavity of the scapula.
- Anatomical components
 - Articular cartilage
 - Coracohumeral, glenohumeral, & transverse humeral ligaments
 - Glenoid labrum
 - Bursae
- Movements
 - Flexion / Extension
 - Abduction / Adduction
 - Circumduction

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Figure 9.13 – The elbow joint.



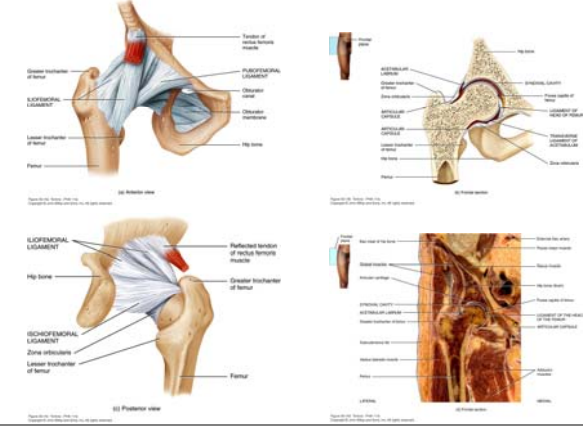
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Elbow joint

- Formed from the humeral trochlea and capitulum, the trochlear notch of the ulna, and the head of the radius.
- Anatomical components
 - Articular capsule
 - Ulnar & Radial collateral ligaments
- Movements
 - Flexion / Extension

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Figure 9.14 – The hip or coxal joint.



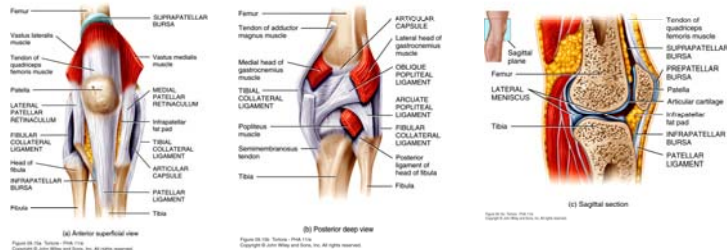
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Hip joint: a ball & socket joint

- It is formed by the head of the femur and the acetabulum of the hip.
- Anatomical components
 - Articular capsule
 - Iliofemoral, pubofemoral, ischiofemoral, and intracapsular, and transverse ligaments
 - Acetabular labrum
- Movements
 - Flexion / Extension, Abduction / Adduction, Circumduction, and Lateral / Medial rotation.

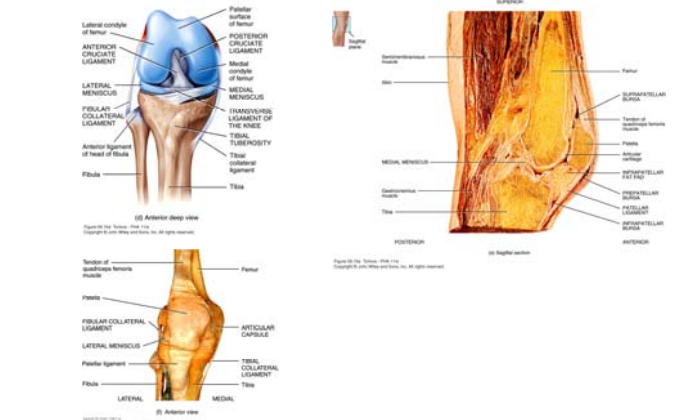
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Figure 9.15 – The knee joint.



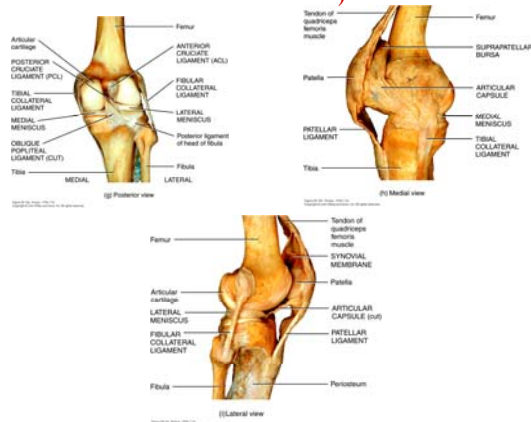
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Figure 9.15 – The knee joint.



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Figure 9.15 – The knee joint.



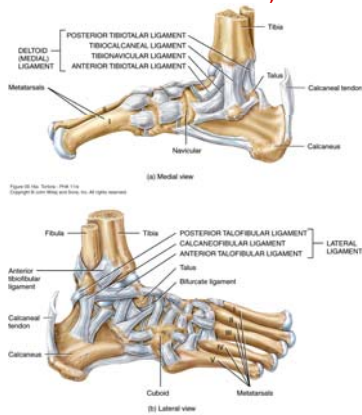
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Knee joint

- It is formed by the femoral and tibial condyles, and the patella
- Anatomical components
 - Articular capsule
 - Medial & lateral patellar retinacula
 - Several ligaments (7), menisci (2), and bursae (3)
- Movements
 - Flexion/Extension, & slight medial/lateral rotation

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Figure 9.16 – The ankle joint.



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Ankle joint

- Formed from the articulations among the lateral and medial malleoli, and the talus.
- Anatomical components
 - Articular capsule
 - Deltoid (medial) and lateral ligaments
- Movements
 - Dorsiflexion / Plantar flexion

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End Chapter 9

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