# INTRODUCTION TO JOINTS (Chapter 8)

## Classification of Joints:

- a joint is a site where 2 or more bones **meet** (not necessarily moving together ie. sutures)
- classified by **structure** (*what holds the joint together? Is there a cavity?*) & by **function** (*how much freedom of movement is allowed at that joint?*)
- **structurally** – 3 types:
  - **fibrous**
  - **cartilaginous**
  - **synovial**

**[*arthro = joint*]**

- **functionally** – 3 types:
  - **synarthroses – no movement**
  - **amphiarthroses – some movement**
  - **diarthroses – full movement**

## FIBROUS JOINTS:

bones joined by fibrous CT; no joint cavity so very little to no movement at joint

### Sutures (=Synostose; NO movement):

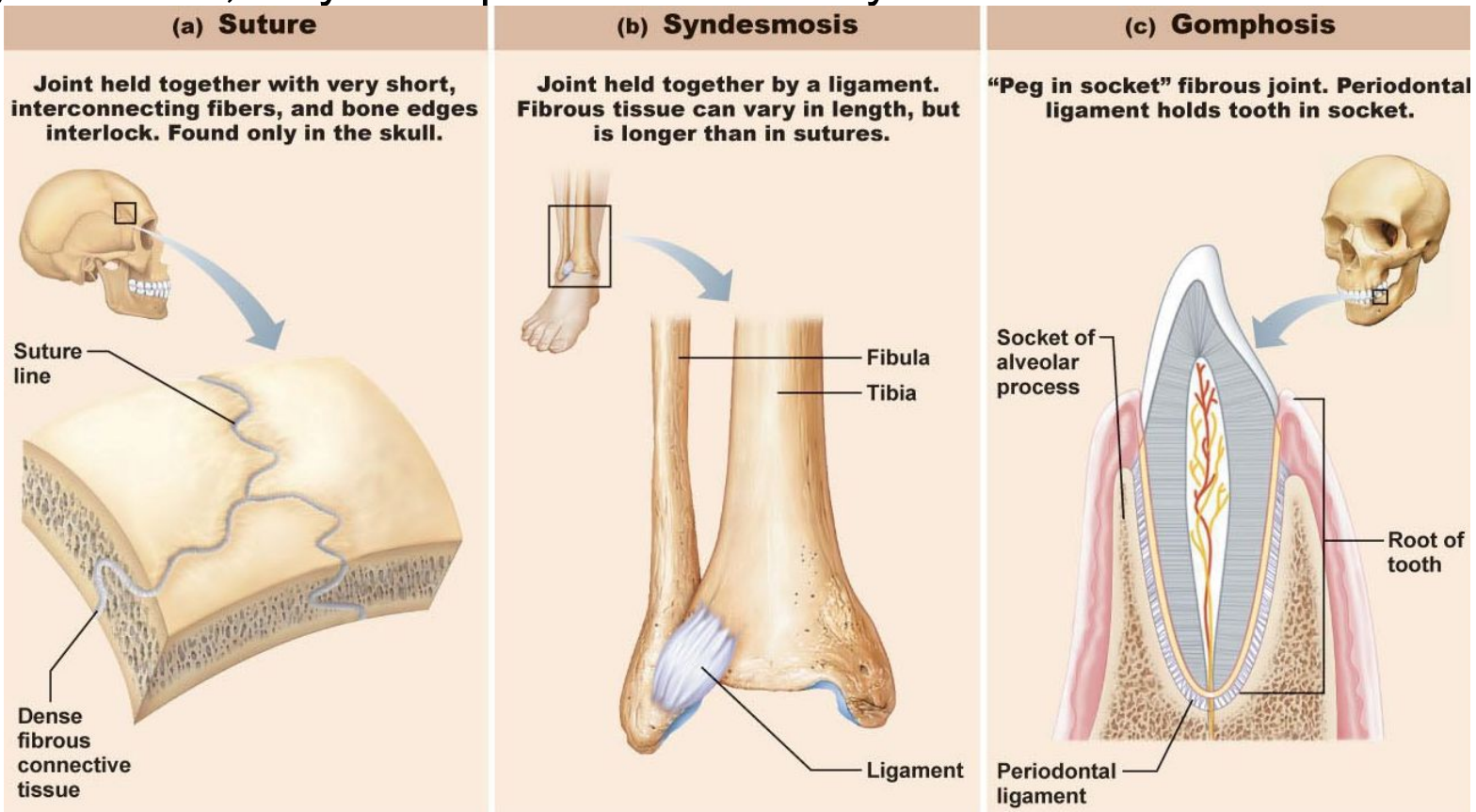
- seams, only found between bones of skull
- overlapping or interlocking of 2 bones; junction filled with very short CT fibers

### Syndesmoses (very LIMITED movment):

cord (**ligament**) or sheet (**interosseous membrane** ie.around ulna/radius)of fibrous CT

### Gomphoses: (gompho = nail [Greek])

- peg-in-socket; only example = tooth in bony socket



**CARTILAGENOUS JOINTS:** bones are united by **cartilage** (no joint cavity)

**Synchondroses:**

- areas of growth: eg: **epiphyseal plates**, between each of 1st 7 ribs & sternum

**Symphysis:**

- articular surfaces covered with hyaline cartilage - linking plate of fibrocartilage
- strength with flexibility: eg: **pubic symphysis, intervertebral joints**

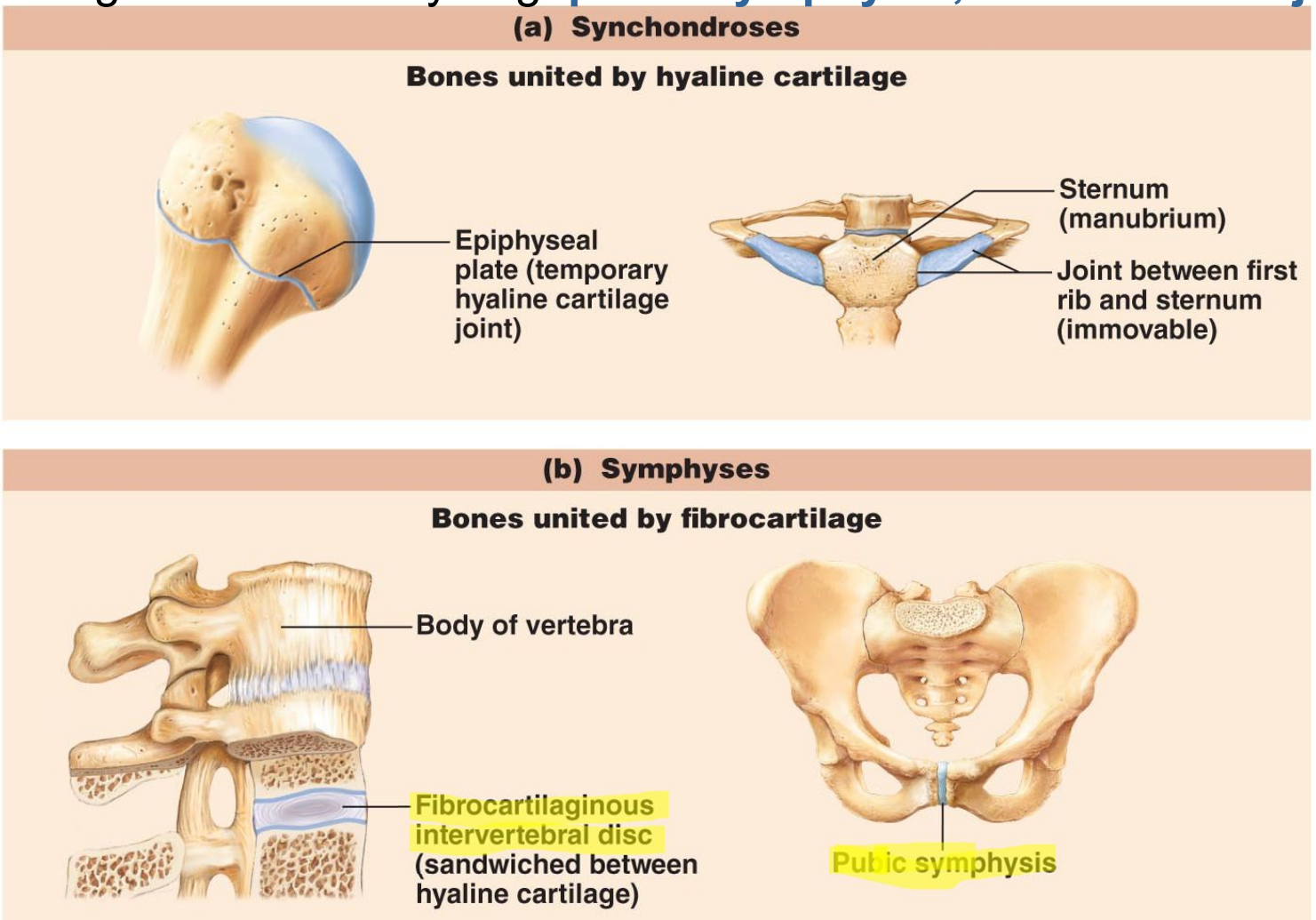



**Fig. 8.2**

## SYNOVIAL JOINTS

most joints - lots of movement

***5 characteristics:***

1. **Articular cartilage**:
   covers opposing bone surfaces
   cushioning so bone isn't crushed
2. **Joint cavity**:
   = synovial cavity; fluid-filled
3. **Articular capsule**:
   double-layered
4. **Synovial fluid**:
   fills joint cavity; reduces friction
5. **Reinforcing ligaments**:
   restrict movement of joint

some synovial joints have fatty pads for cushioning (hip/knee joints) or articular discs to improve fit (knee/jaw joints)

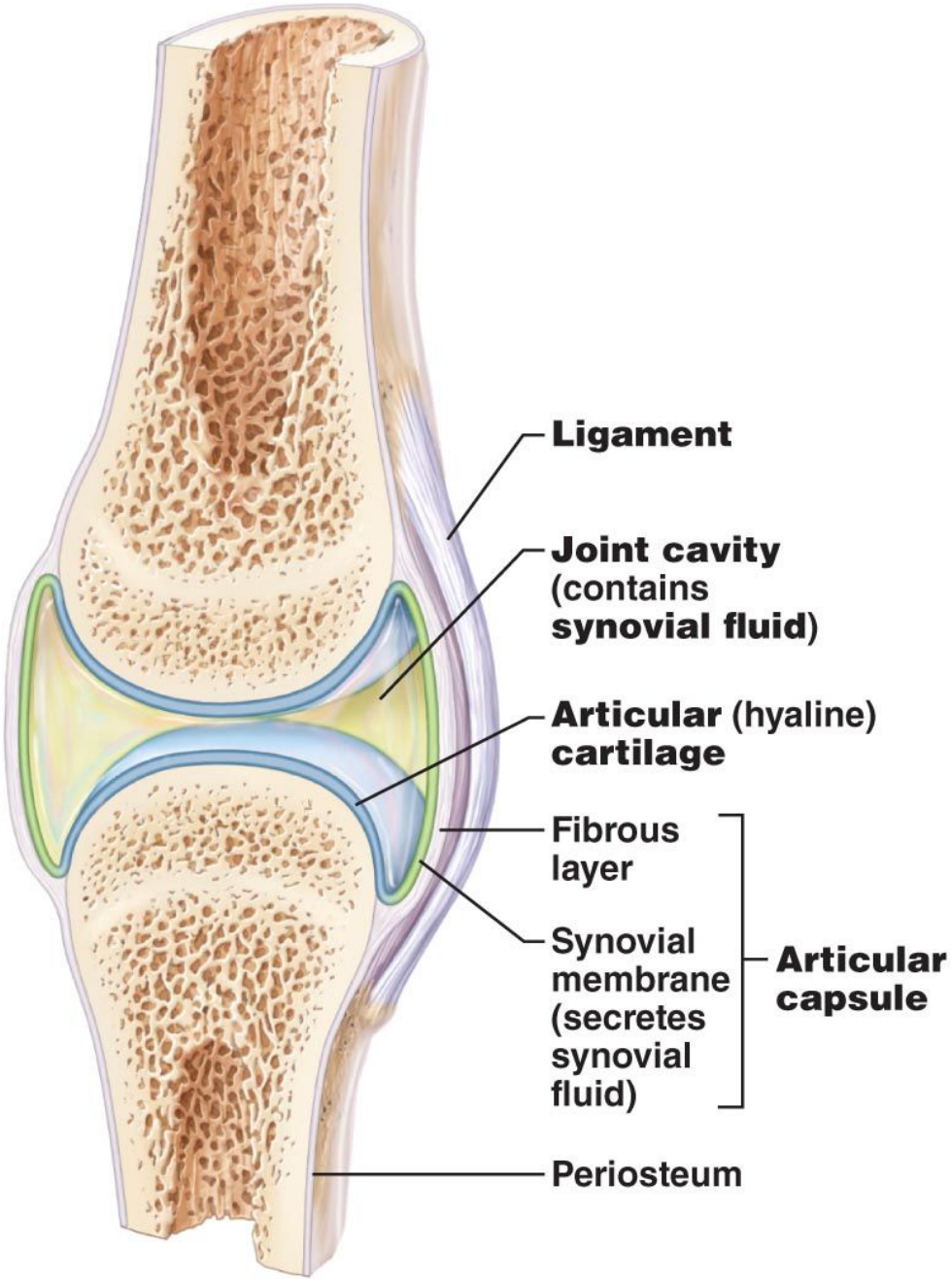



**Fig. 8.3: General structure of a synovial joint**

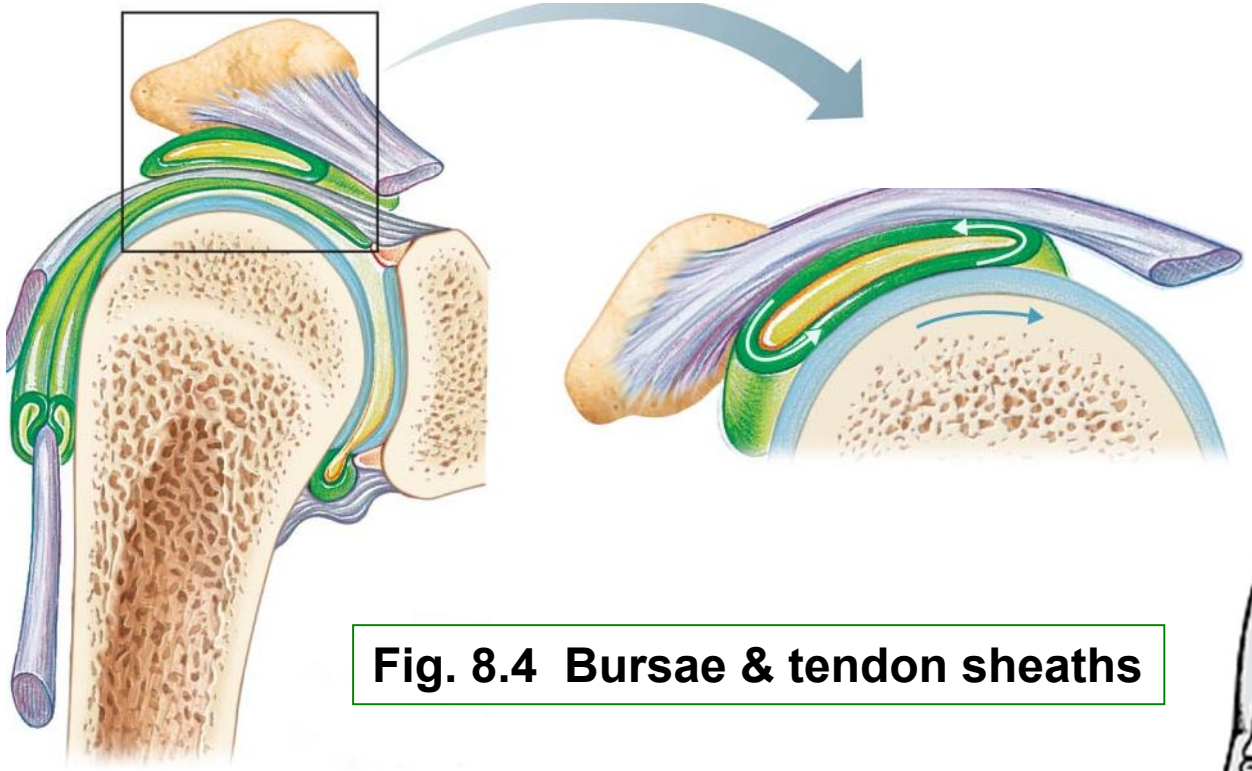
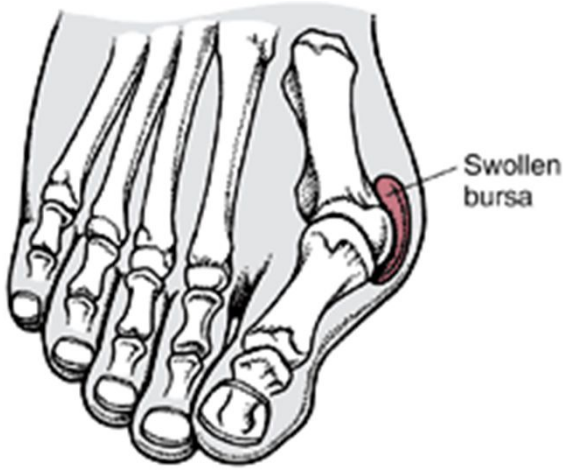


**Fig. 8.4 Bursae & tendon sheaths**

***what is a bunion?***
enlarged bursa at base of big toe




## Bursae & tendon sheaths:

bags of lubricant -> reduce friction

(1) **bursa** is a sac lined with synovial membrane containing a thin film of synovial fluid; found where ligaments, muscles, skin or muscle tendons overlie & rub against bone

(2) **tendon sheath** = elongated bursa that wraps around a tendon

## Factors that influence stability of *synovial* joints

- synovial joints allow lots of movement, so they're not as stable as fibrous or cartilaginous joints

### *3 factors influence joint stability:*

(1) **articular surfaces**:

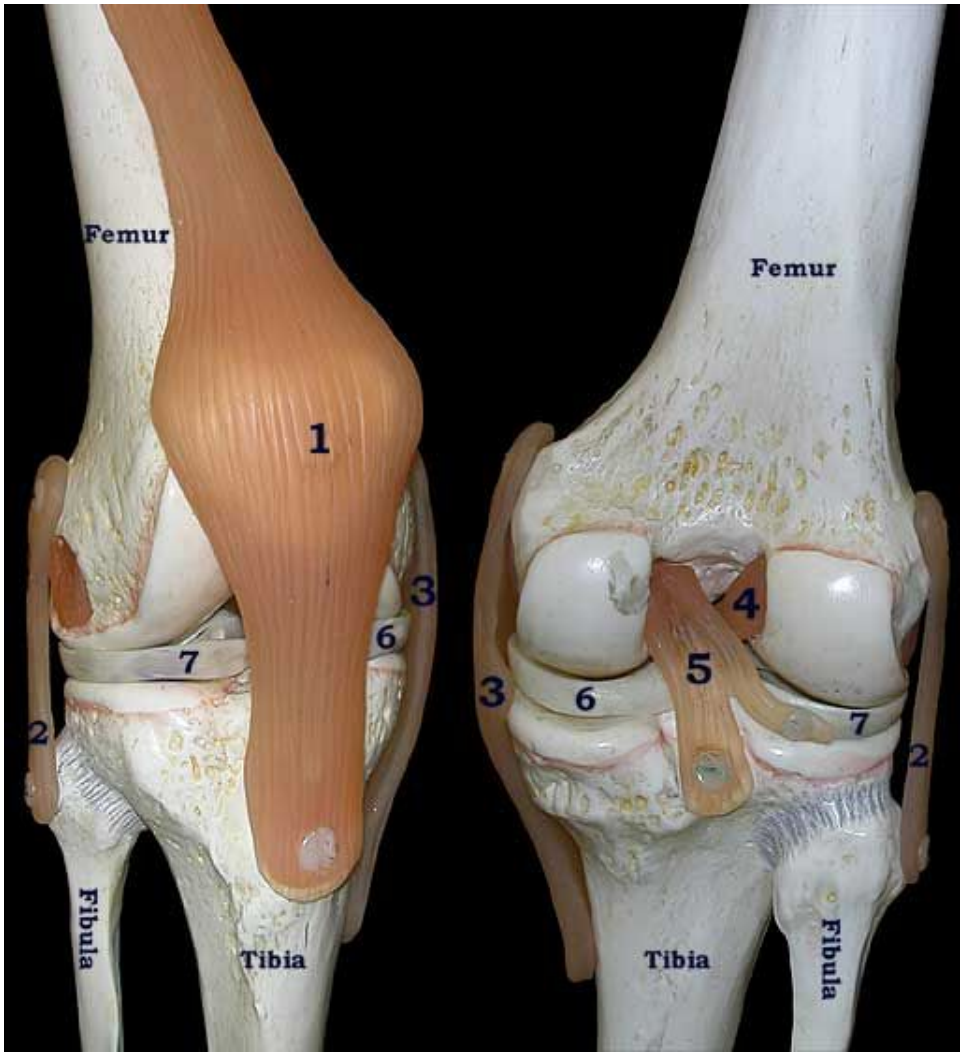
- shape of articular surfaces of many joints don't contribute to stability (ie. shapes of bones won't align perfectly)
- deep ball & socket joints have good shape for stability

(2) **ligaments**:

- more ligaments = more strength and less extent of movement = more stability
- ligaments can only stretch ~6% of length before they break - **stretched** ligaments stay **stretched**

(3) **muscle tone**:

- tendons of muscles crossing joints usually most important stabilizing factor - kept taut by **muscle tone**




**www.uky.edu/.../110Lab7/ Lab7Images/KneeJoint.jpg**

## Common Joint Injuries

**Sprains:**

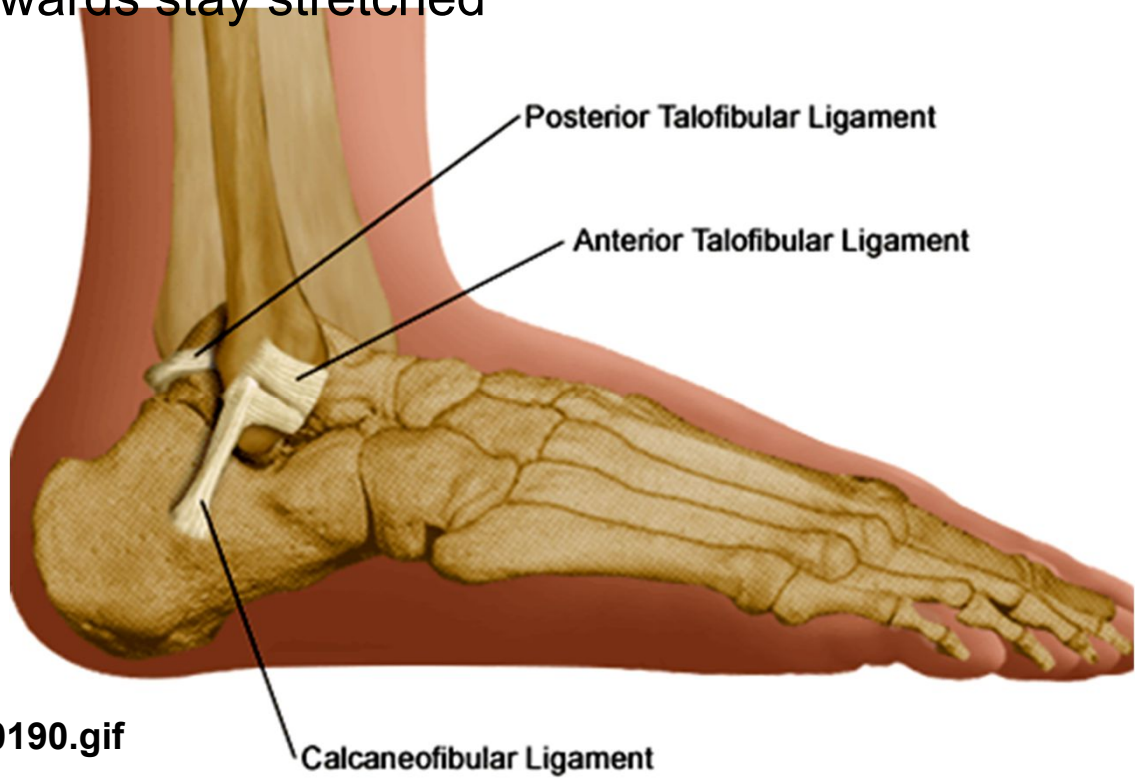
**partially torn** ligaments repair themselves (slowly due to poor vascularization)
completely torn ligaments require surgery to realign 2 ends of ligament

**Cartilage injuries:**

usually at the knee - because cartilage has no blood supply, cannot repair itself
pieces break off / interfere with joint function »» arthroscopic surgery

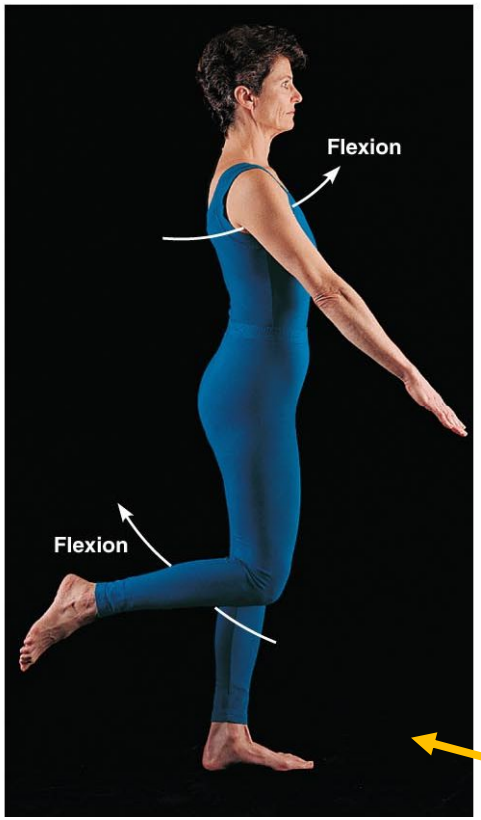
**Dislocations:**

bones forced out of their normal positions at a joint; need to be reduced
repeat dislocations are common because ligaments get stretched and then afterwards stay stretched

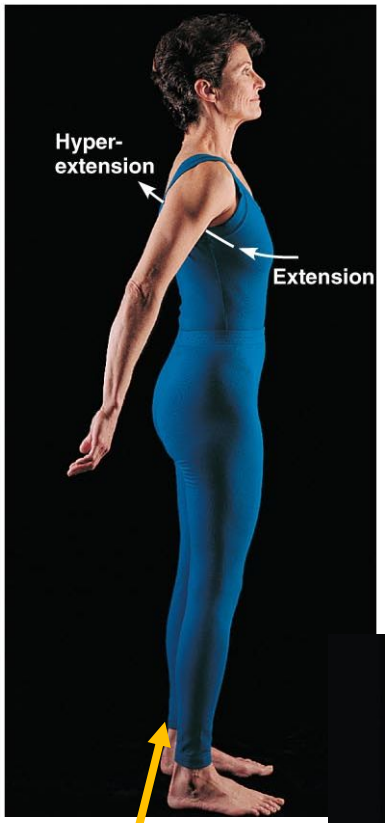



www.stlouischildrens.org/. ../images/ei_0190.gif

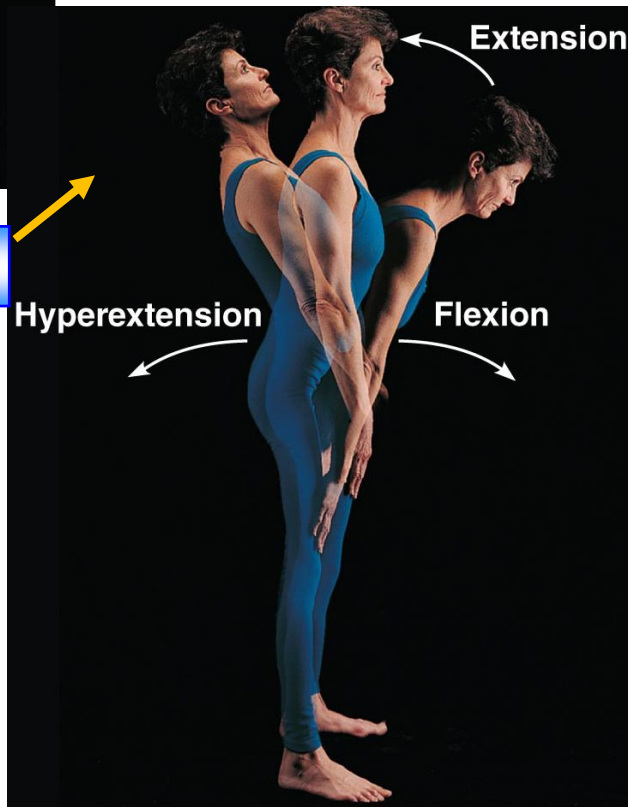
# Movements allowed by Synovial Joints

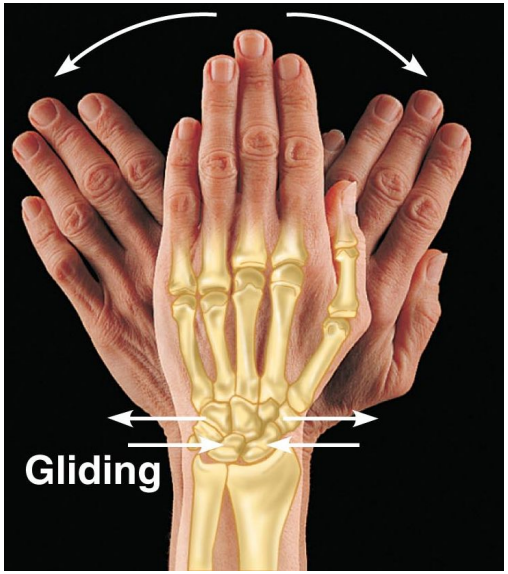






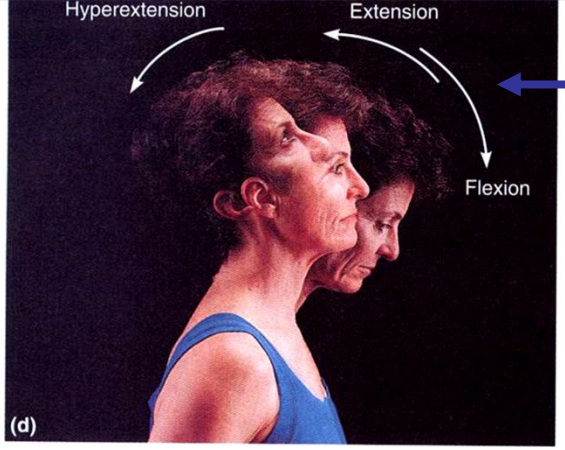

Angular Movements

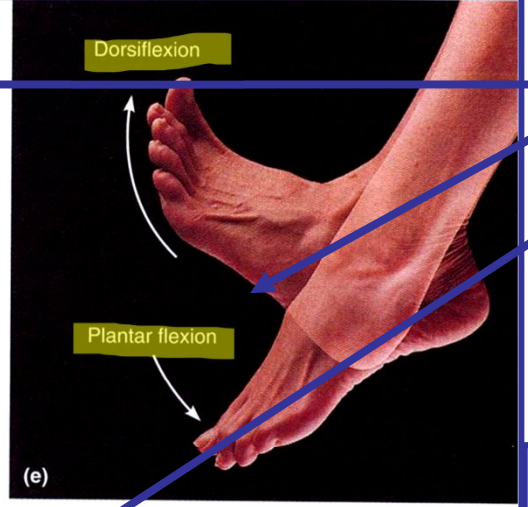


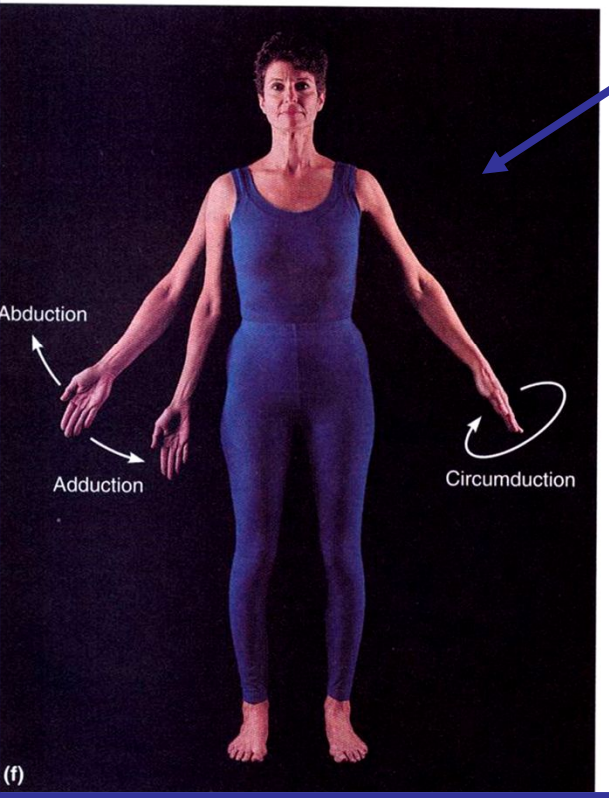



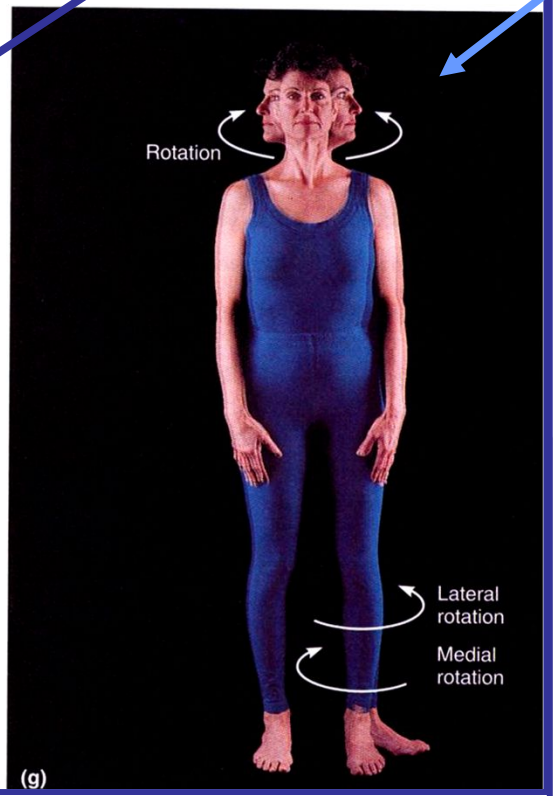
Angular movements

Rotations

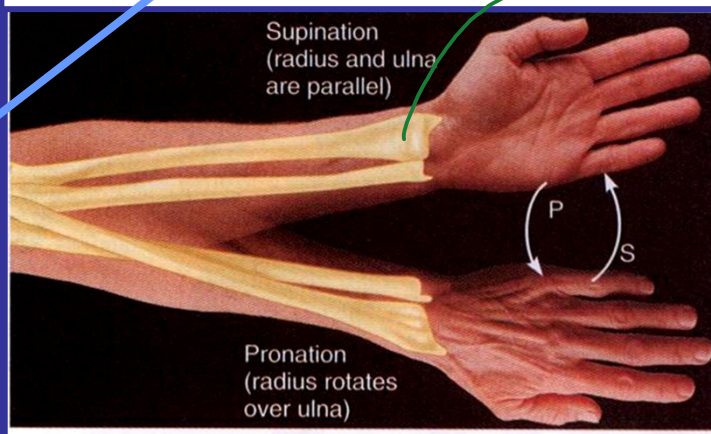


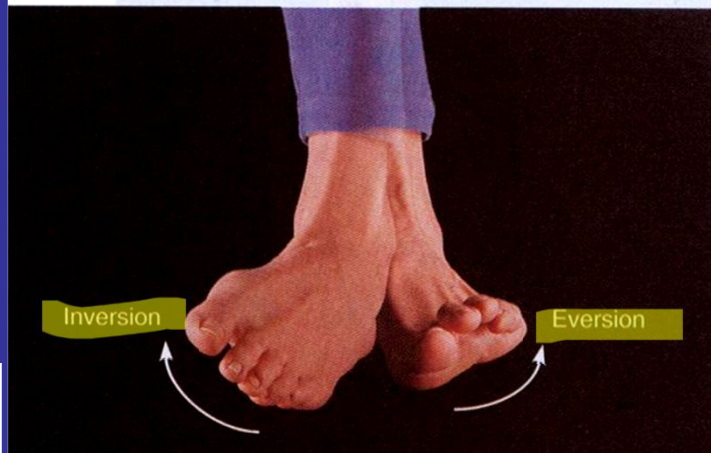



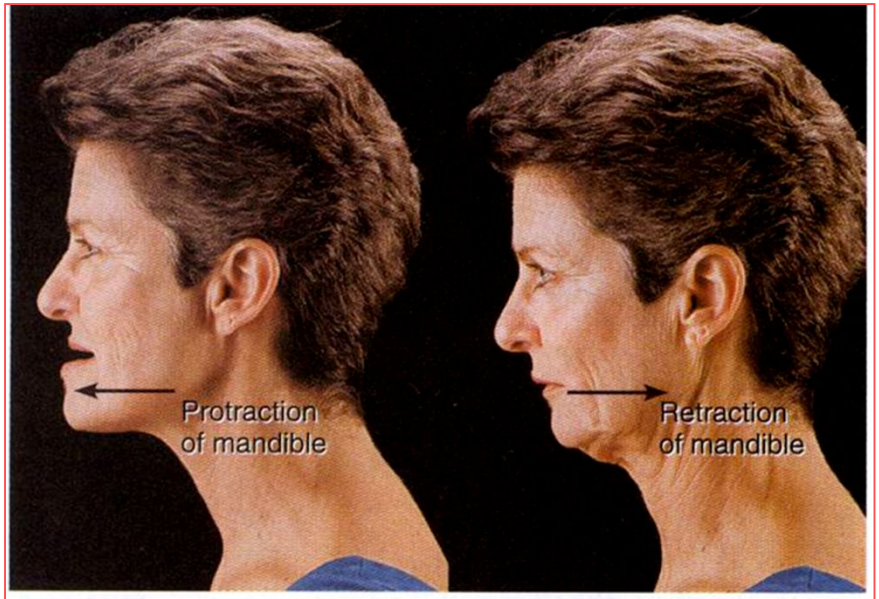




radius

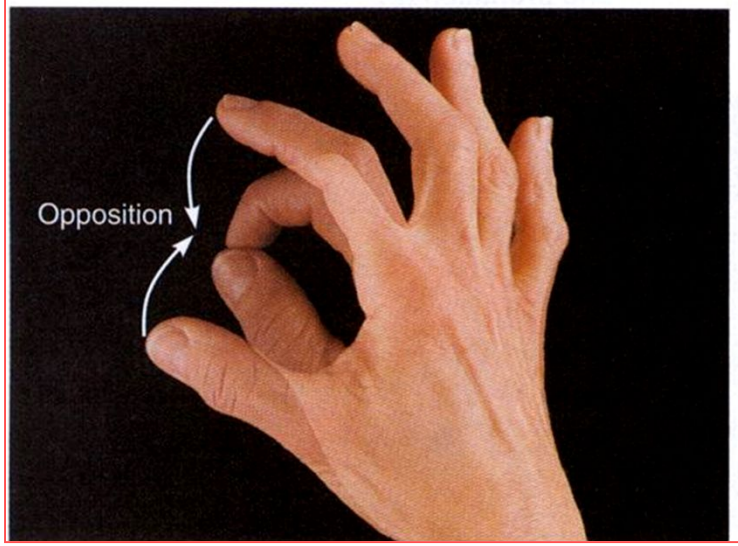


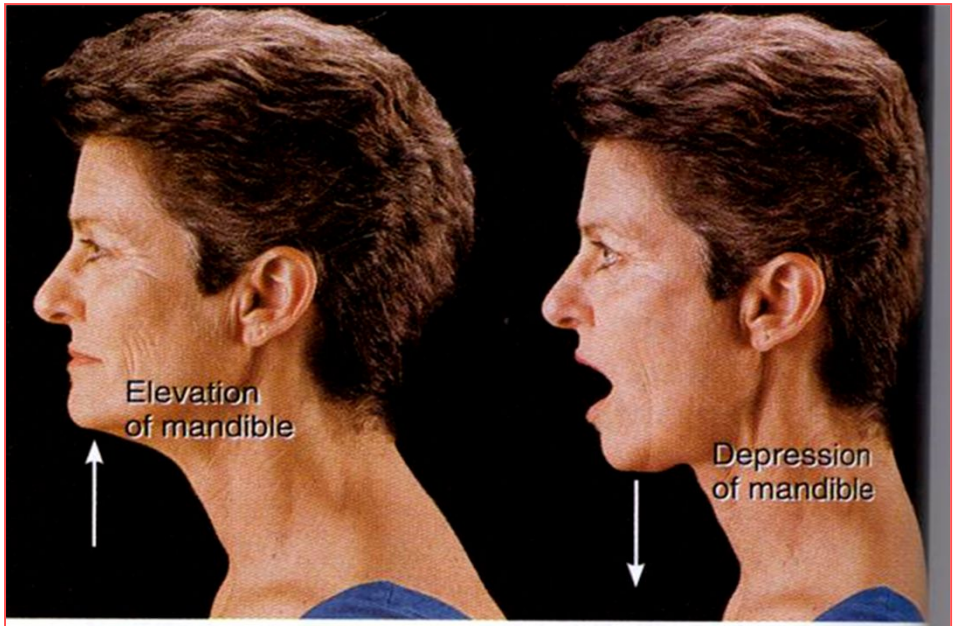

(a) Supination (S) and pronation (P)






(c) Protraction and retraction

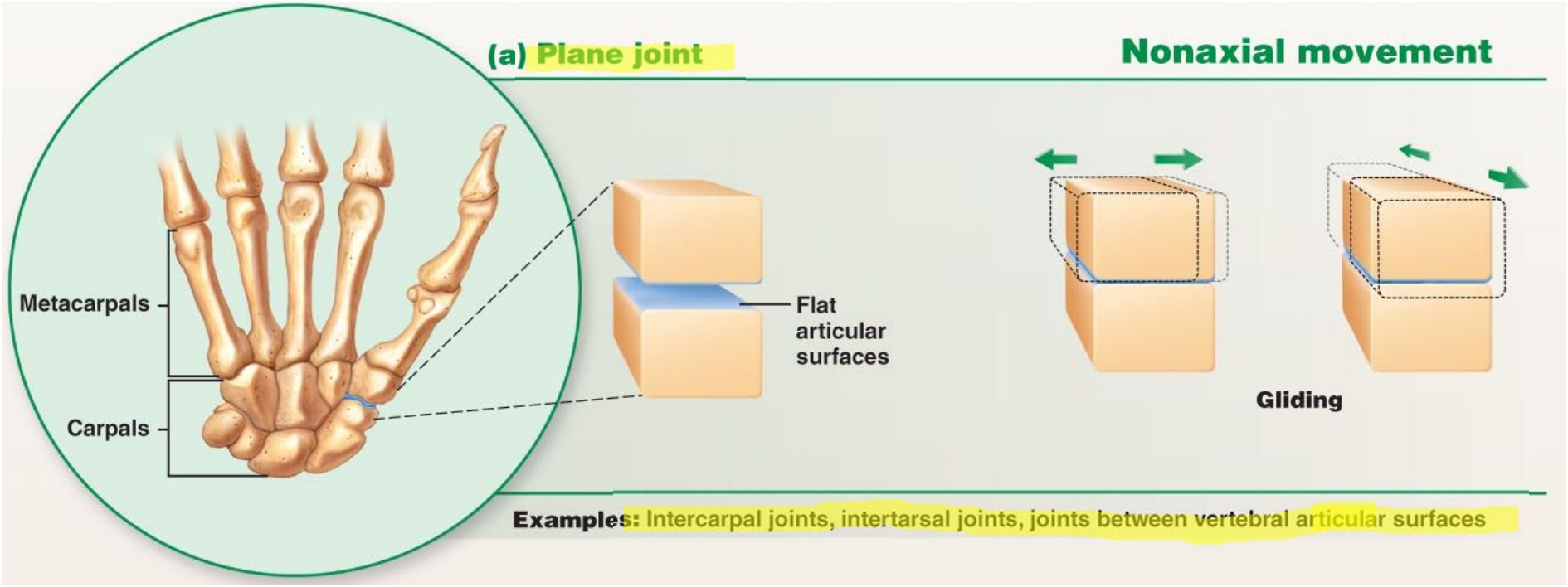



(d) Elevation and depression

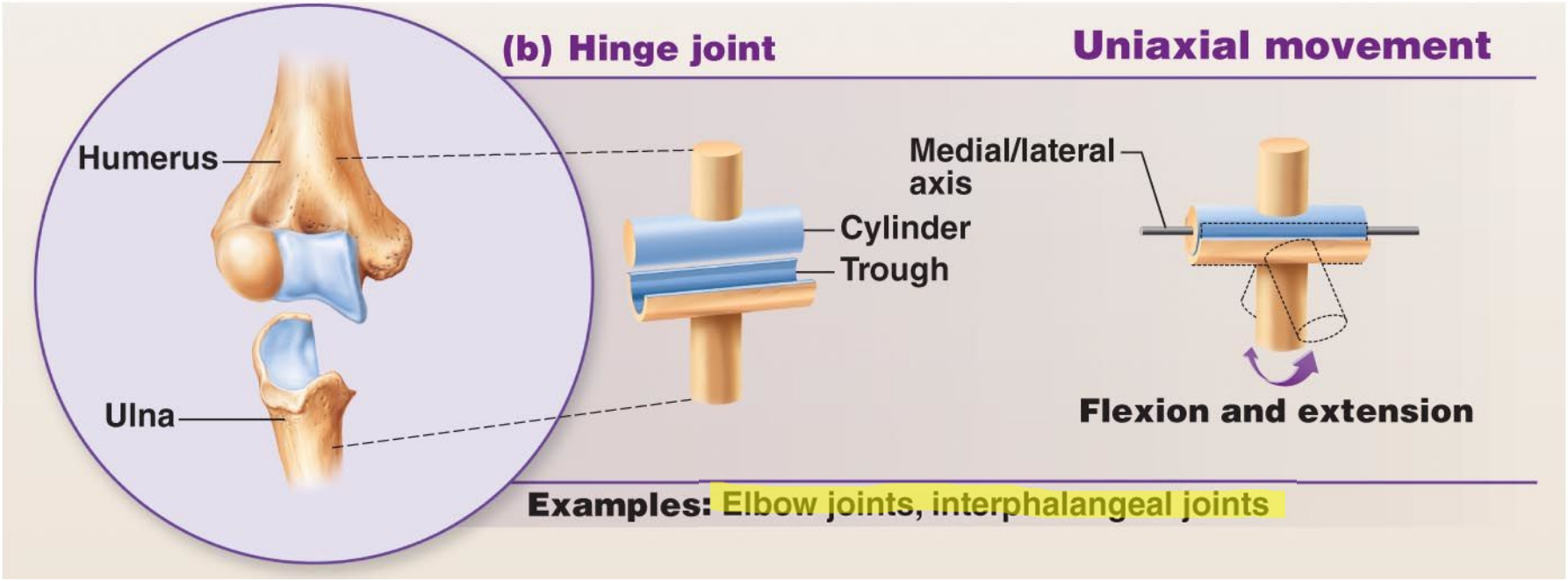
Special movements

# Shape of articulating surfaces determines types of movements permitted by these synovial joints



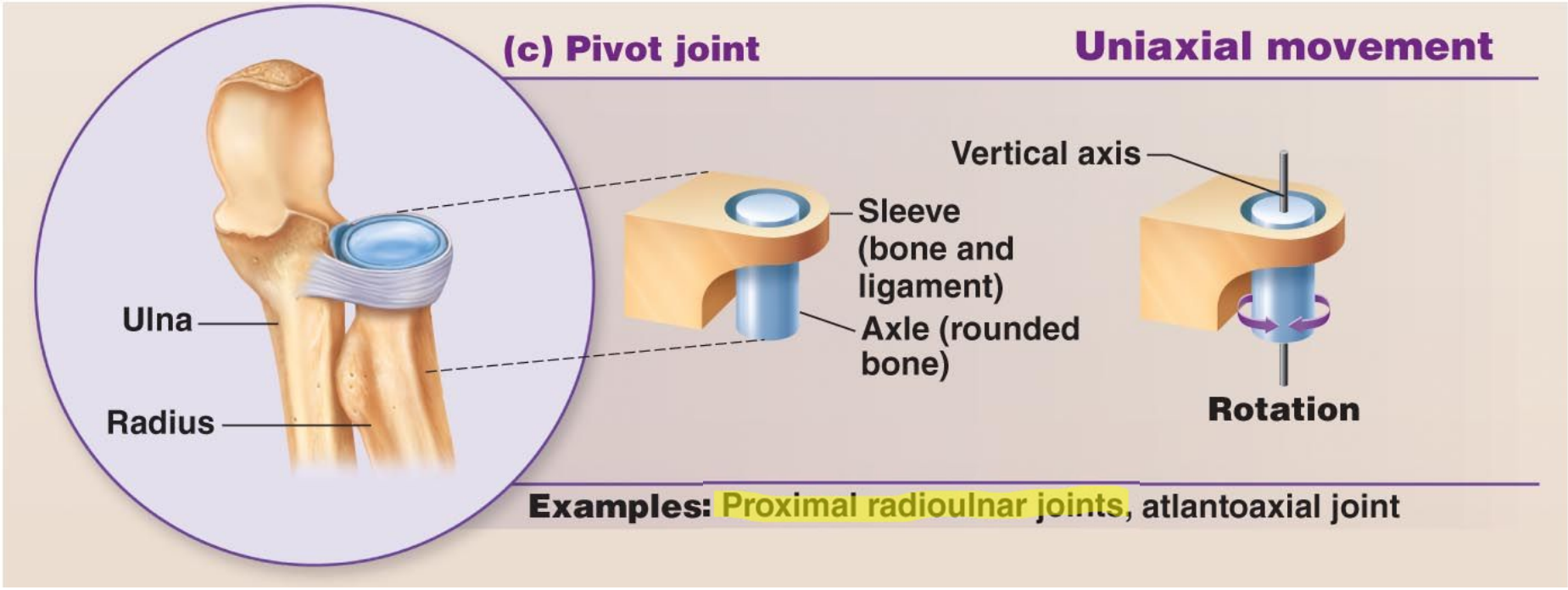

**(1) plane joint:**
**2 flat opposing surfaces**
**gliding**
**e.g. intercarpal joints**

**Focus Figure 8.1** *(this slide plus the next 5 slides)*

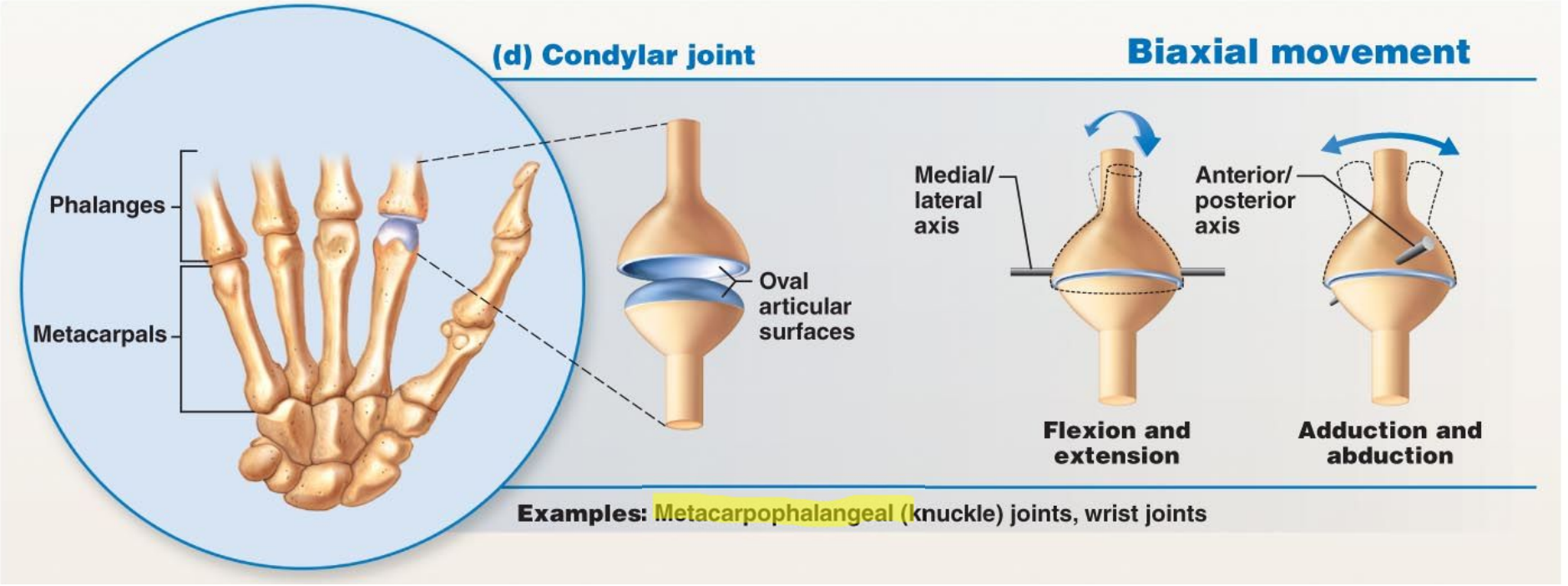


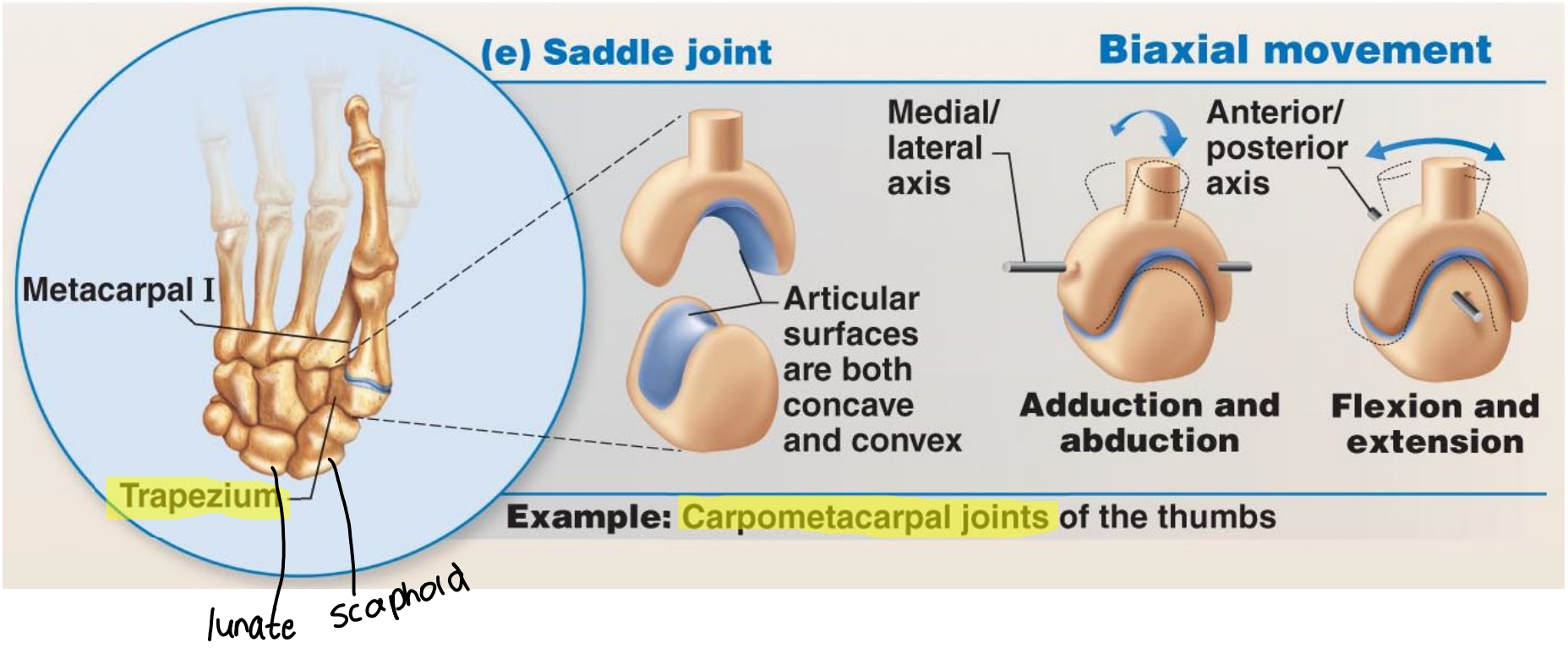

(2) hinge joint: cylinder into trough – flexion/ extension e.g. elbow, knee

## (3) pivot joint : insertion into a ring or sleeve eg: between atlas & dens of axis (atlantoaxial)

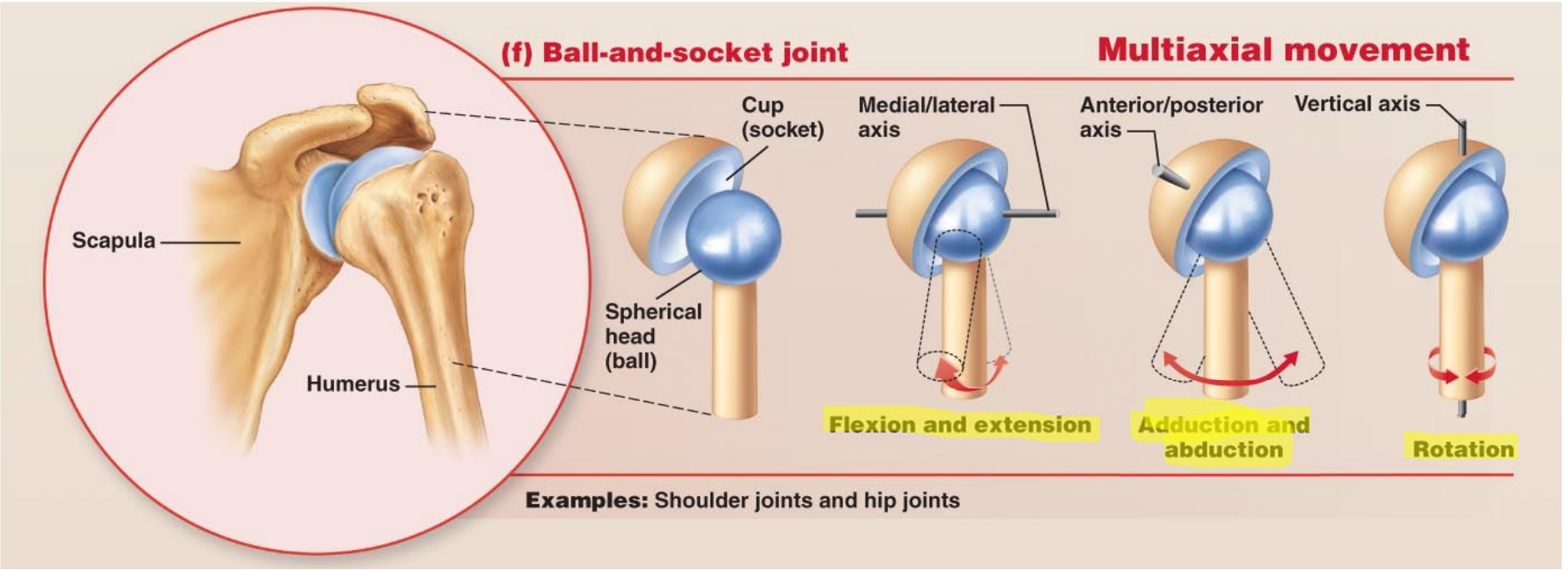


## (4) condylar joint = “knuckle-like”- both articulating surfaces are ovals
## allow all planes of motion



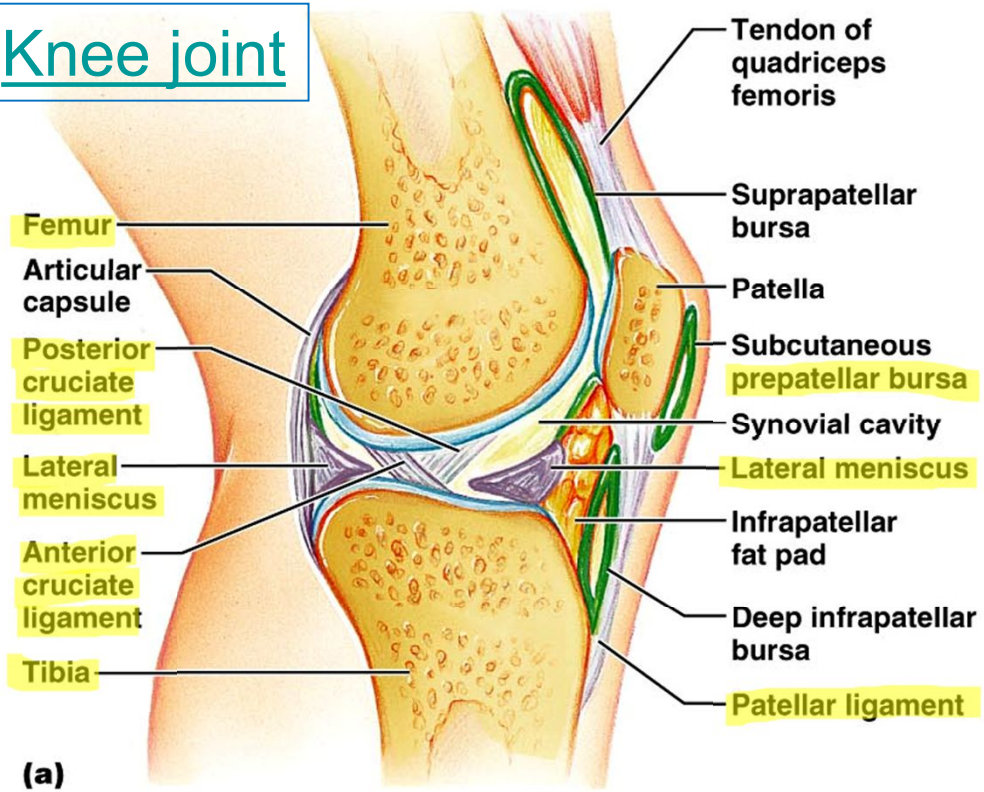



**(5) Saddle joint – similar to condylar, but saddle shape permits even more freedom of movement**



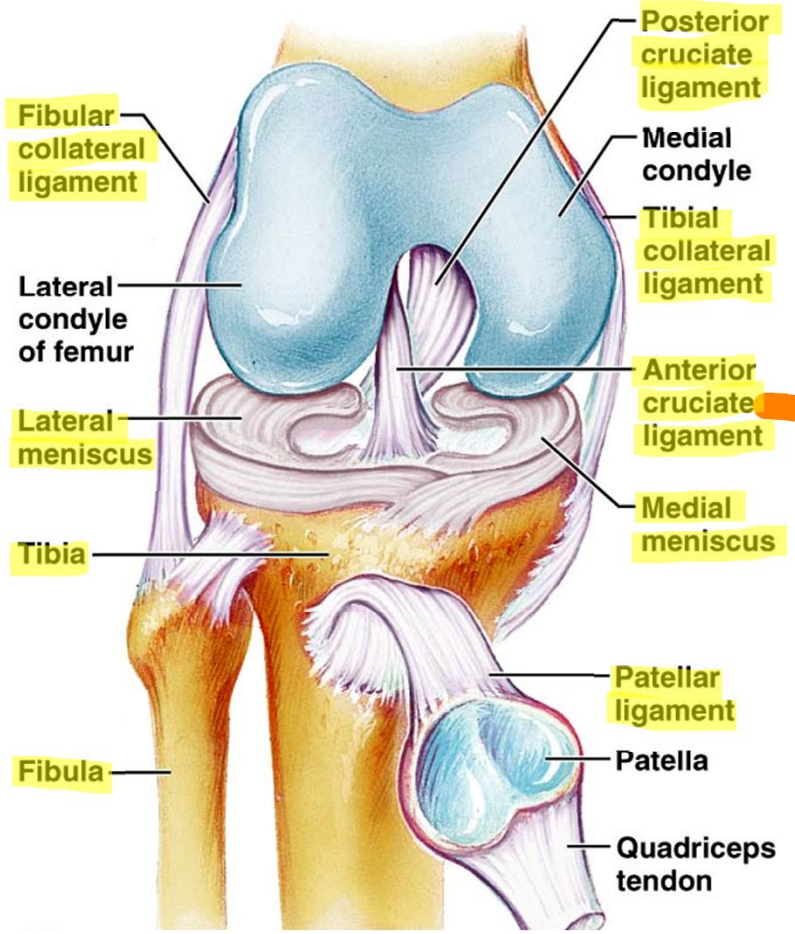

(6) **Ball-and-socket joint** – shoulder joints and hip joints

# Knee joint




**Lateral view**

Figure 8.7



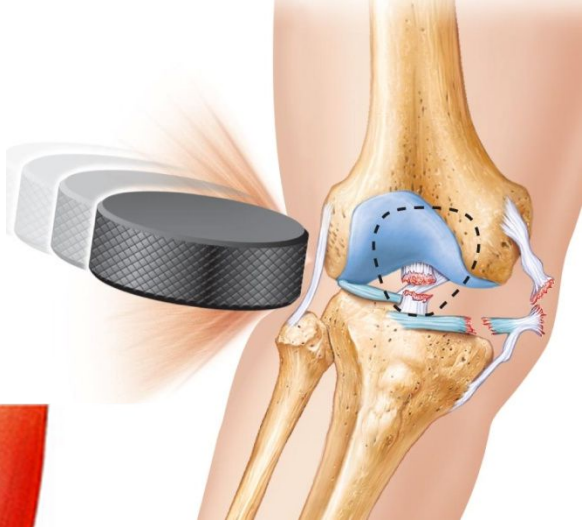

**Frontal view (right knee)**

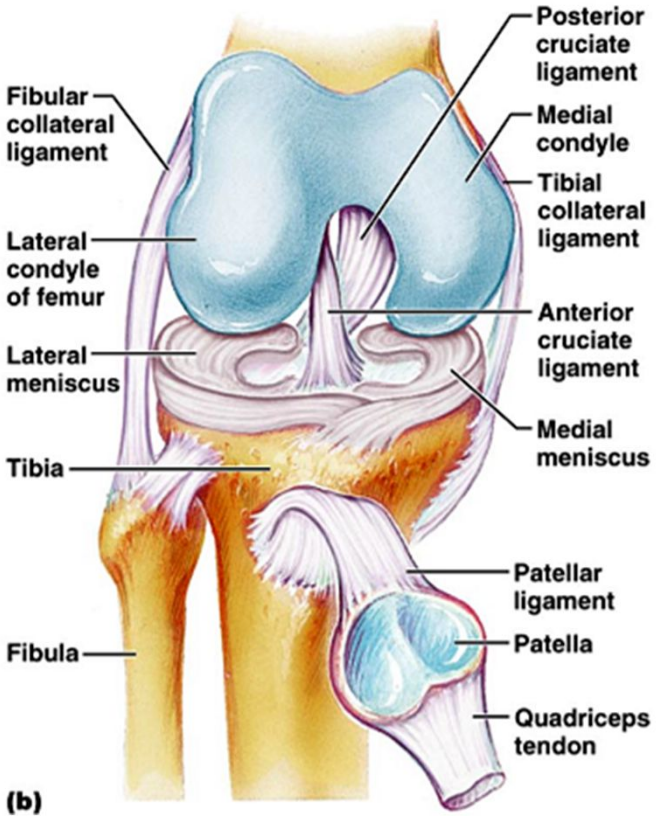
Knee joint – flexion extension and slight rotation

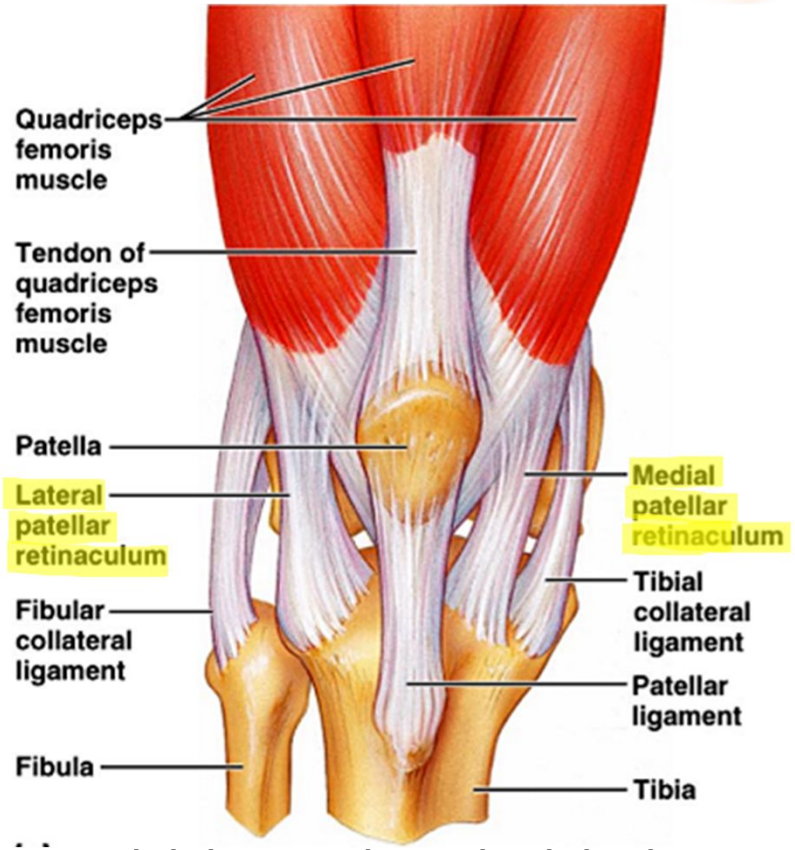
Three joints – femoropatellar, lateral tibiofemoral and medial tibiofemoral

Anteriorly, joint capsule is replaced by 3 broad ligaments that are continuous with the quadriceps tendon (**patellar ligament plus medial and lateral patellar retinacula**). There are 2 intracapsular ligaments (**anterior and posterior cruciate**), 2 **menisci** (medial and lateral, attached at the fibrous capsule) and 2 extracapsular ligaments (**fibular collateral** and **tibial collateral**). Note the subcutaneous **prepatellar bursa**.

# Tearing of tibial collateral & anterior cruciate ligaments and medial meniscus



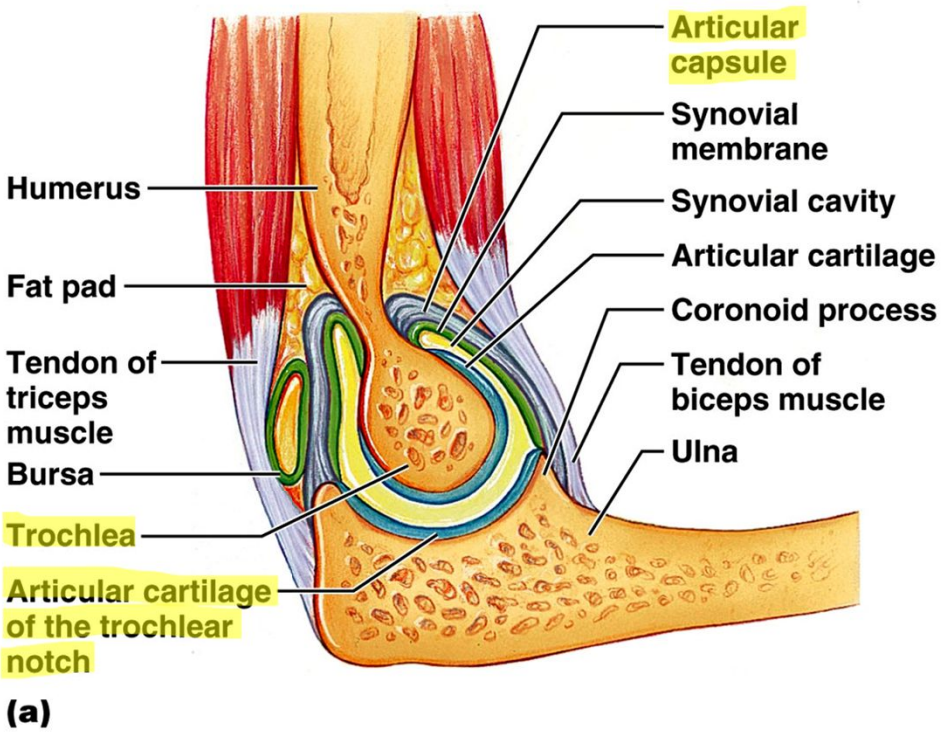


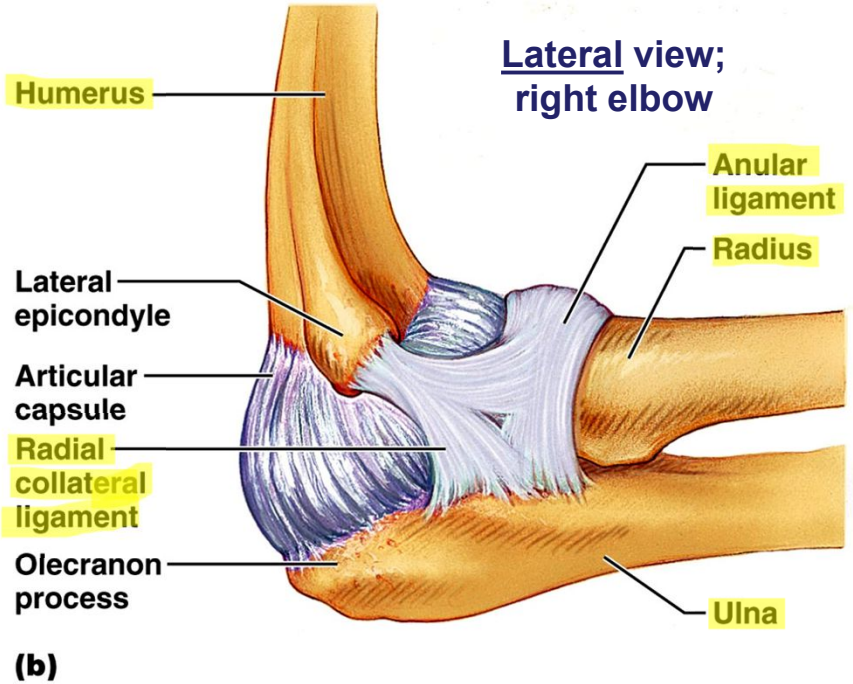



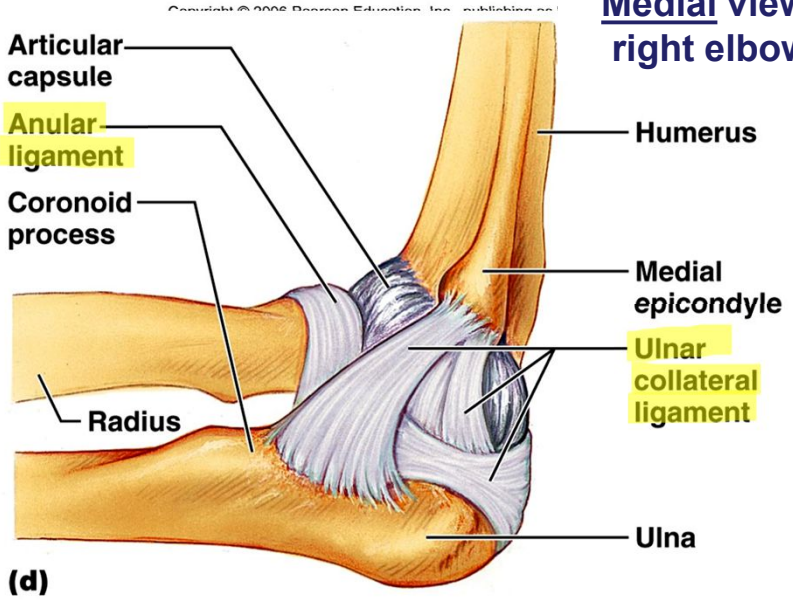

## Knee joint

This slide is not to introduce new material, but to show the joint in context of muscle attachments – Note that the cruciate ligaments are covered by synovial membrane and therefore are outside the synovial cavity.

# Elbow joint




Hinge joint: - largely through the articulation of the **trochlea** of the humerus with the **trochlear notch** on the ulna. The joint is stabilized by collateral ligaments and of note is the **annular ligament** allowing rotation of the radius during pronation and supination .

Figure 8.10

# Shoulder joint

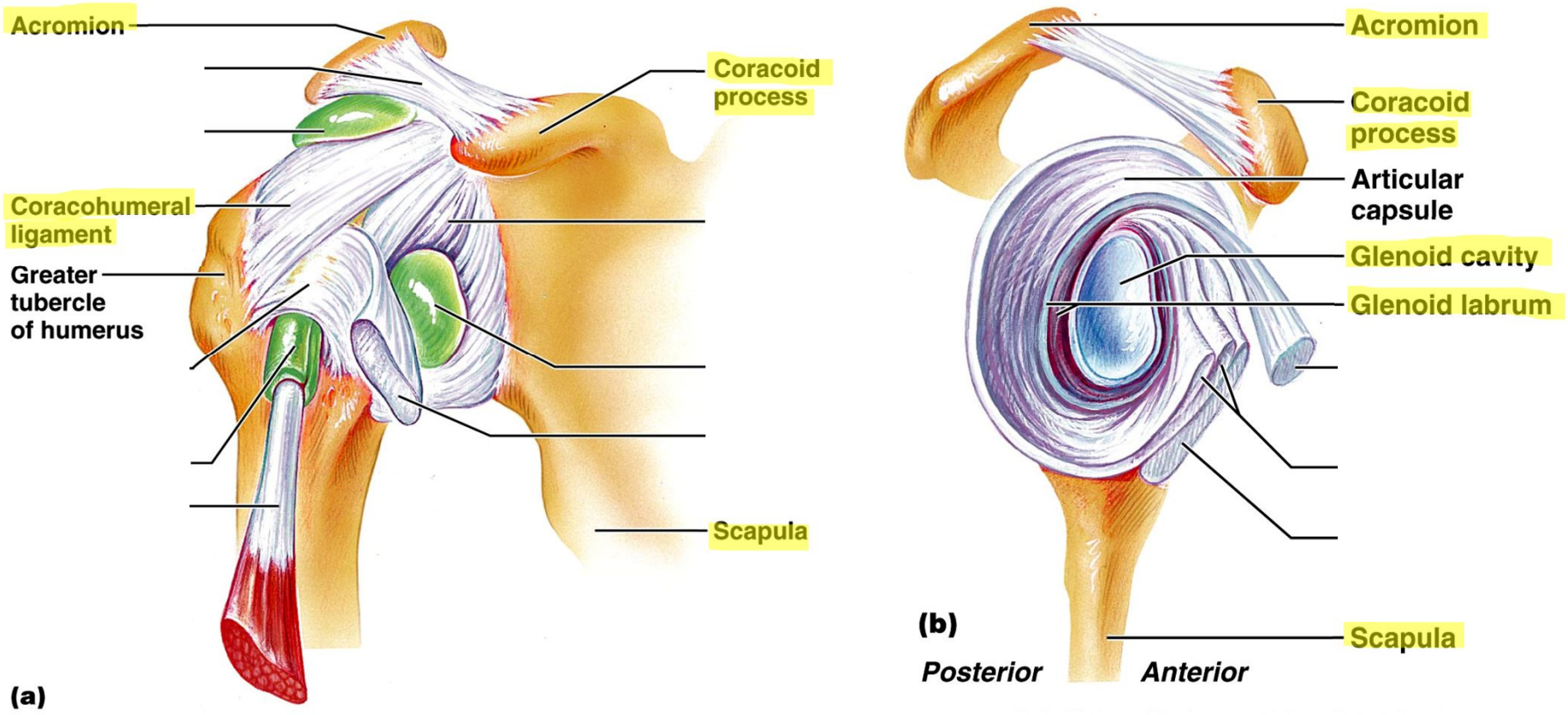


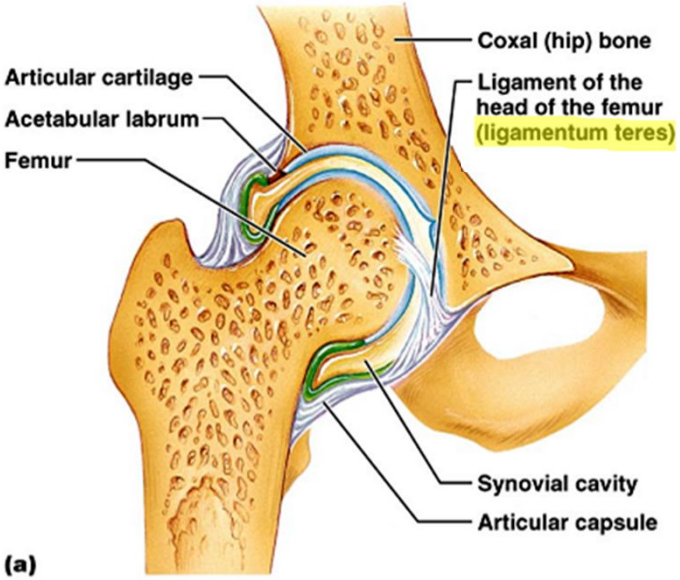

**Figure 8.9**

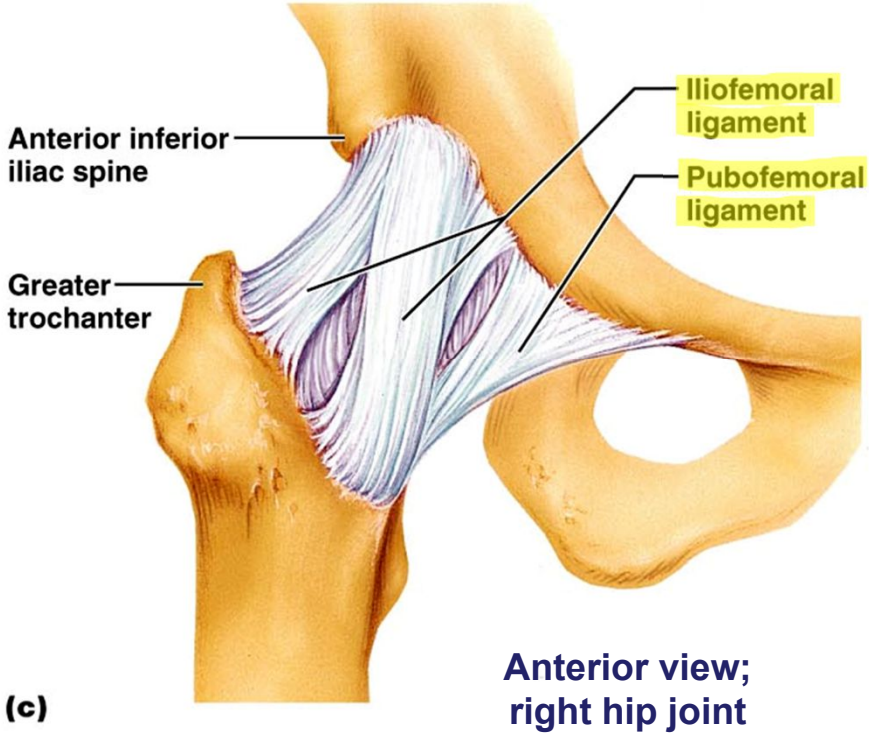
Glenohumoral joint – the glenoid cavity is broadened slightly by the **glenoid labrum** (fibrocartilagenous rim) but is still only 1/3$^{rd}$ the size of the head of the humerus. The only ligament of note is the **coracohumeral**. It is largely the tendons of the rotator cuff muscles that stabilize this joint.

# Hip joint

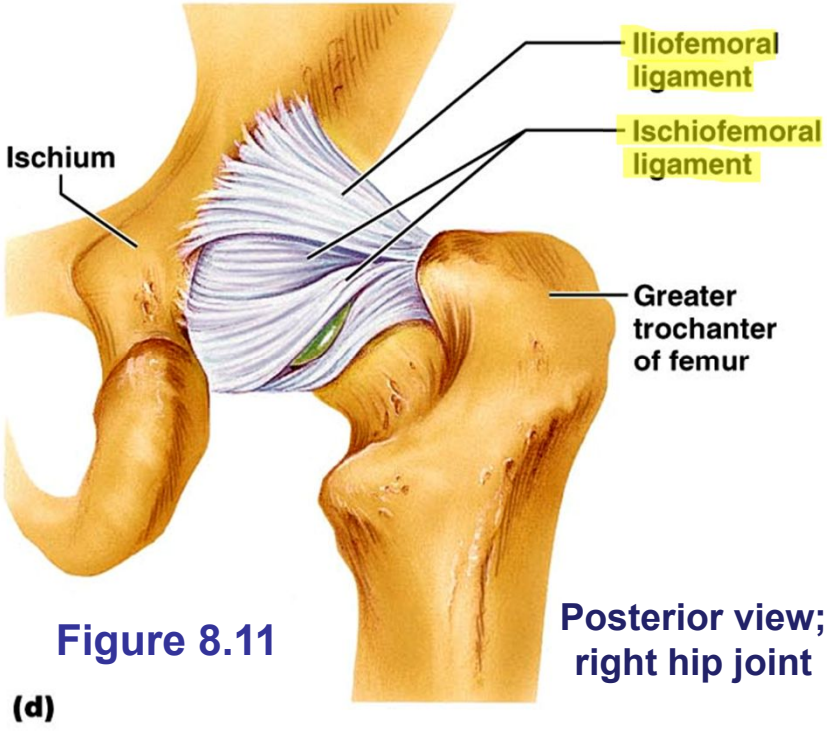
Deep ball and socket joint. There is an intracapsular ligament (ligament of the head of the femur –**ligamentum teres**) but its function in humans is unclear. Damage to its artery may lead to arthritis of the hip joint.

Extracapsular ligaments to note are the **iliofemoral**, **pubofemoral** and **ischiofemoral**.



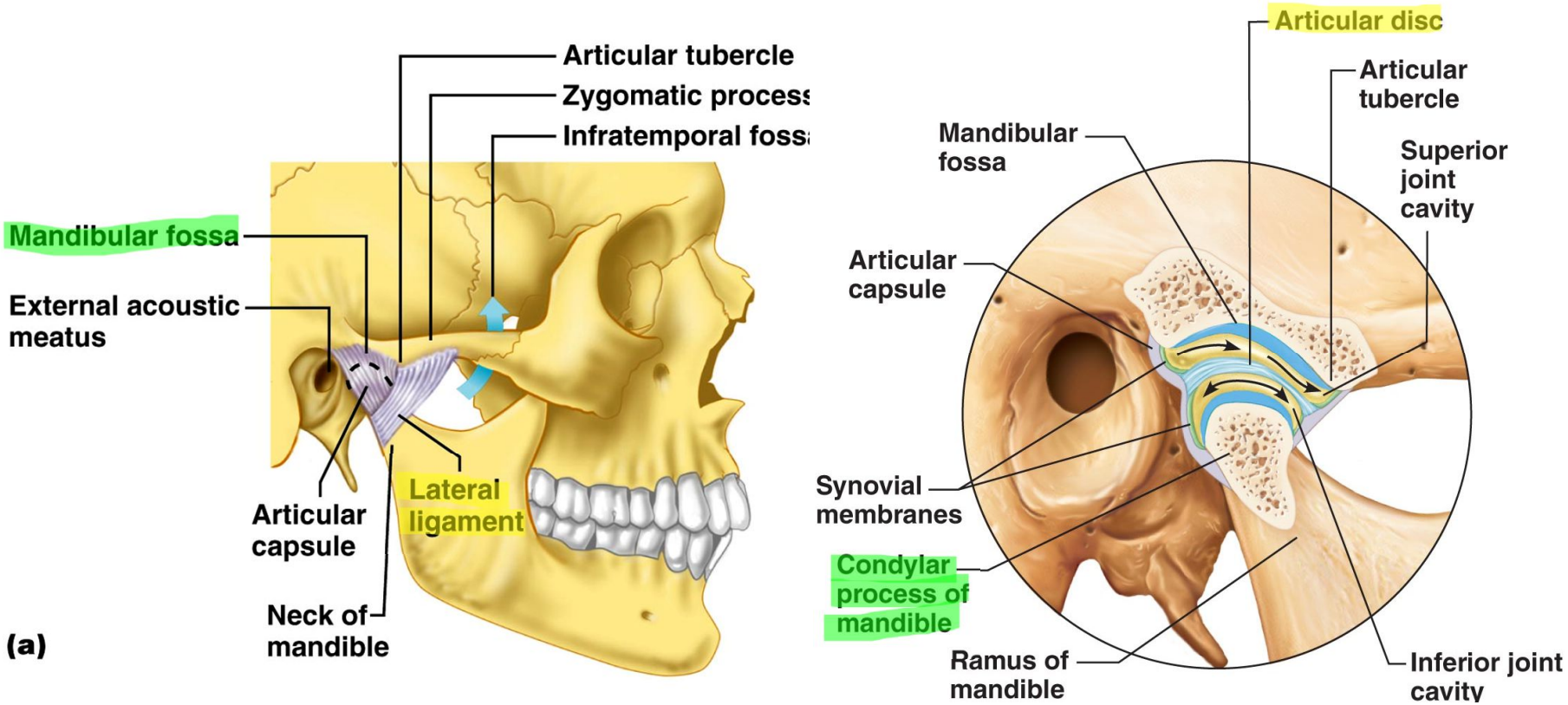

Anterior view; right hip joint




Posterior view; right hip joint

Figure 8.11

# Temporomandibular joint

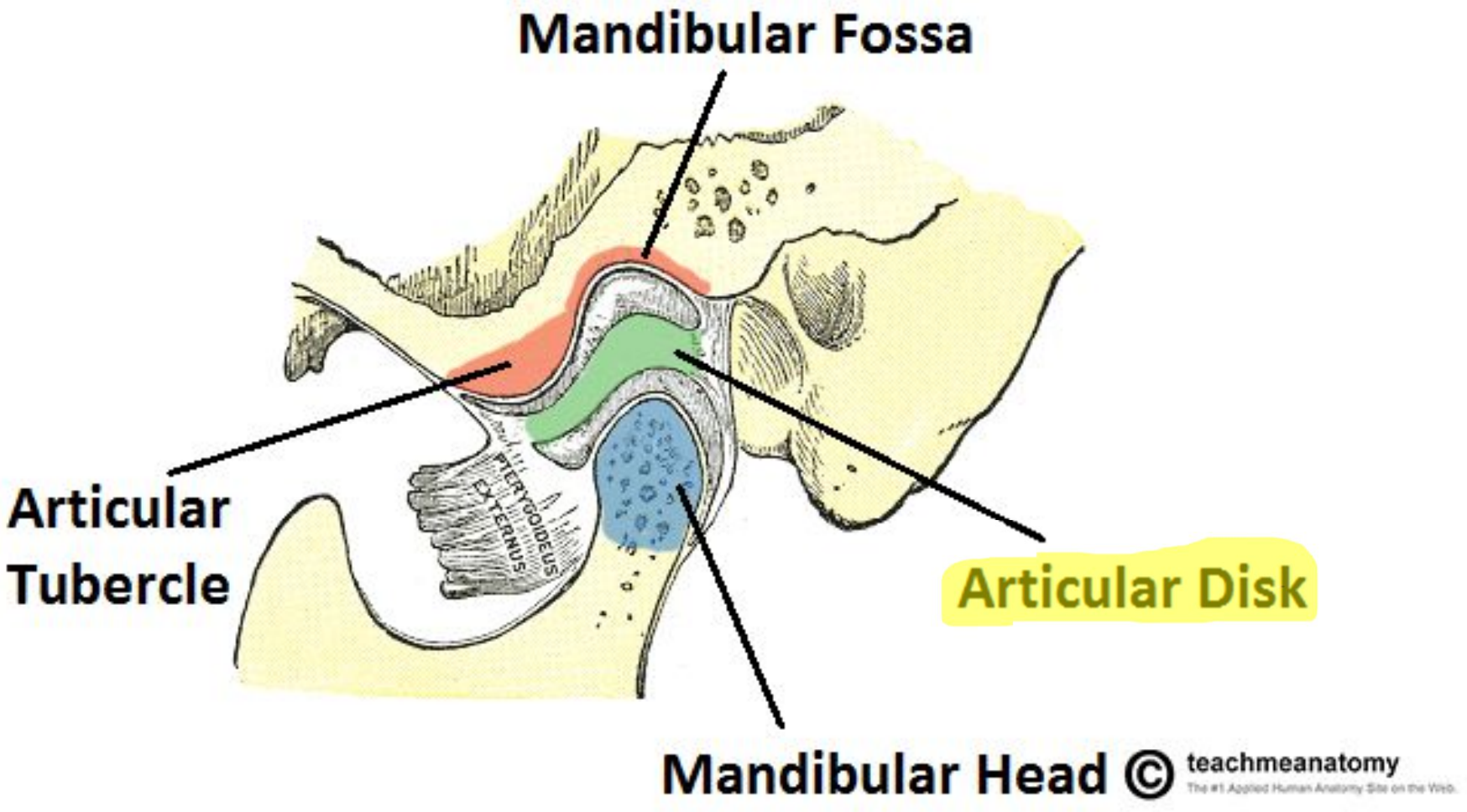



Articulation of the **mandibular condyle** with the **mandibular fossa** and the articular tubercle of the temporal bone. Stabilized by a **lateral ligament**. There is an **articular disk** that divides the synovial cavity into superior and inferior compartments.

Initial jaw opening is hinged (mandibular condyle within the temporal fossa). There is gliding when the condyle articulates with the articular tubercle.

**Figure 8.12**

# Facing the other way – another view to better show tubercle

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