Joints

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Joints

Articulations: The site where 2 or more bones meet.

Joints are the weakest part of the skeleton.

Classification

Functional: Amount of movement allowed

1). Synarthroses: Immovable joints

2). Amphiarthrosis: Slightly movable joint

3). Diarthroses: Fully movable joints

Joints

Classification

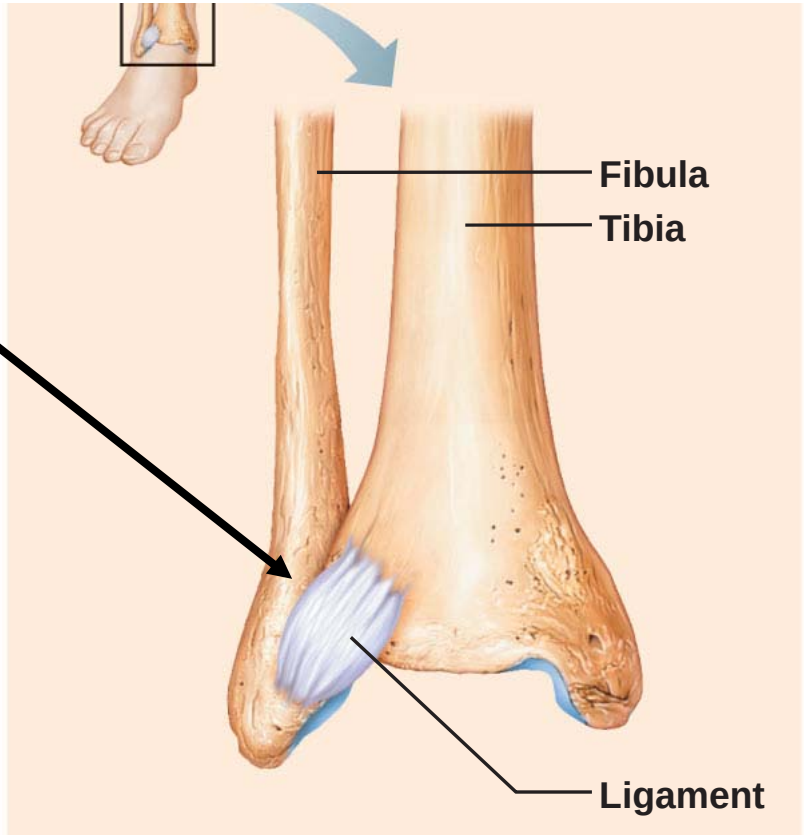
Structural: based on material binding the bone.

1). **Fibrous:** Bone ends united by collagenic fibers

a). Sutures

b). Syndesmoses

c). Gomphoses



Joints

Classification

2). **Cartilaginous Joints**

Bones are united by cartilage

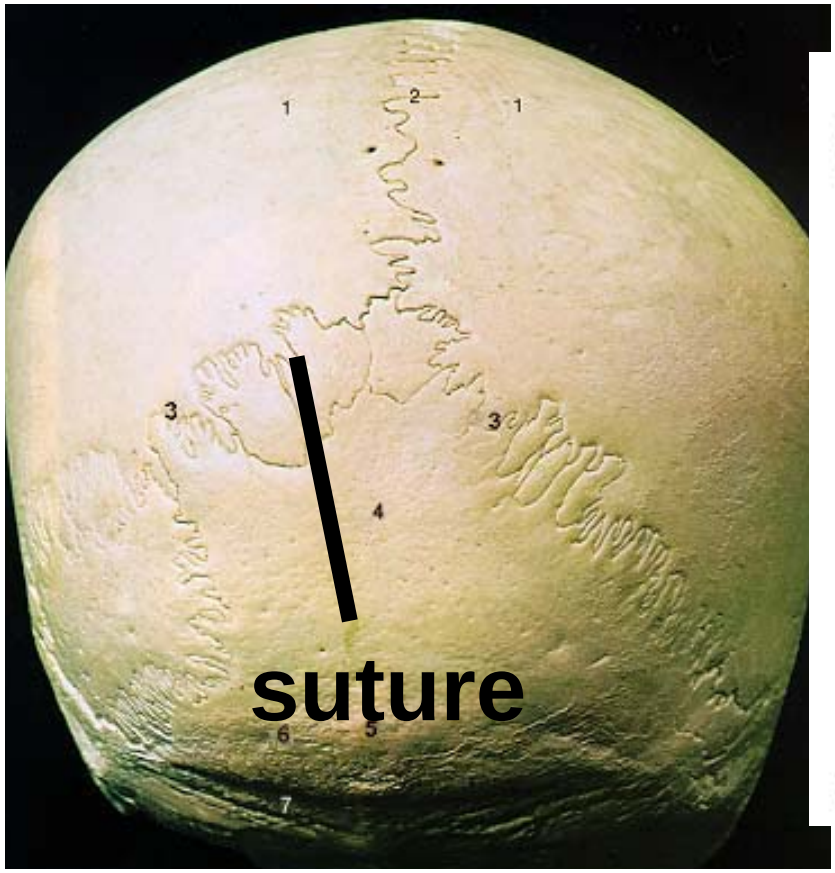
a). Synchondrosis

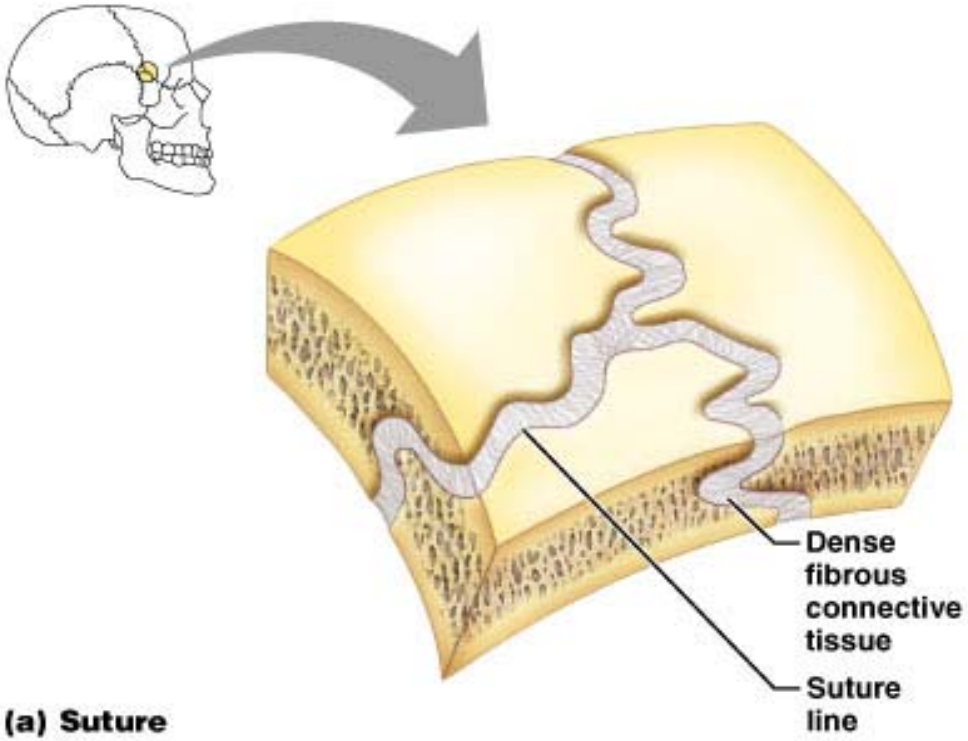
b). Symphyses

c). Synovial Joints

Fibrous Joints

Immovable Joints (synarthrosis)

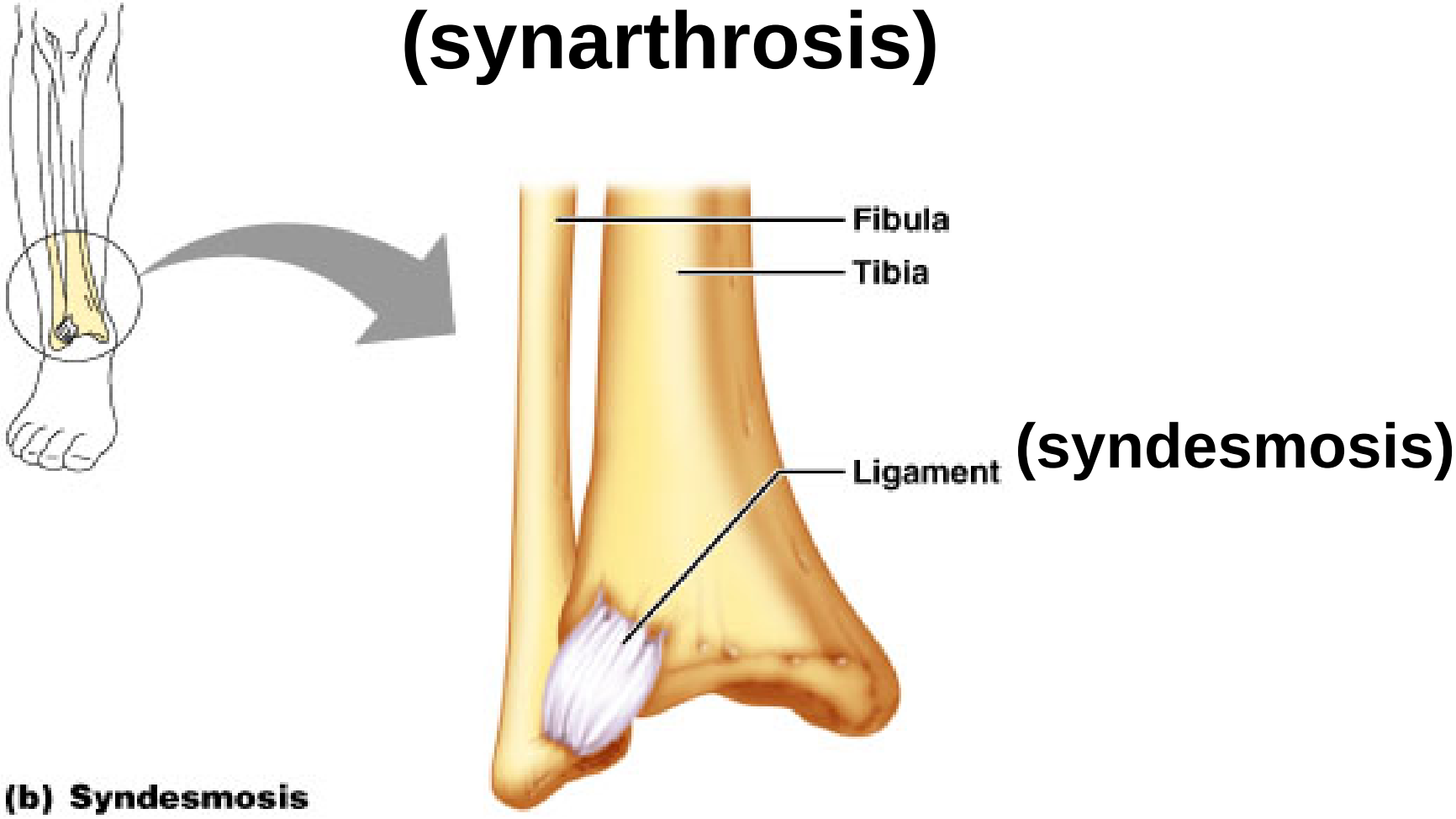




- Bones united by ligament

Fibrous Joints

Immovable Joints (synarthrosis)



(syndesmosis)

- Bones united by ligament

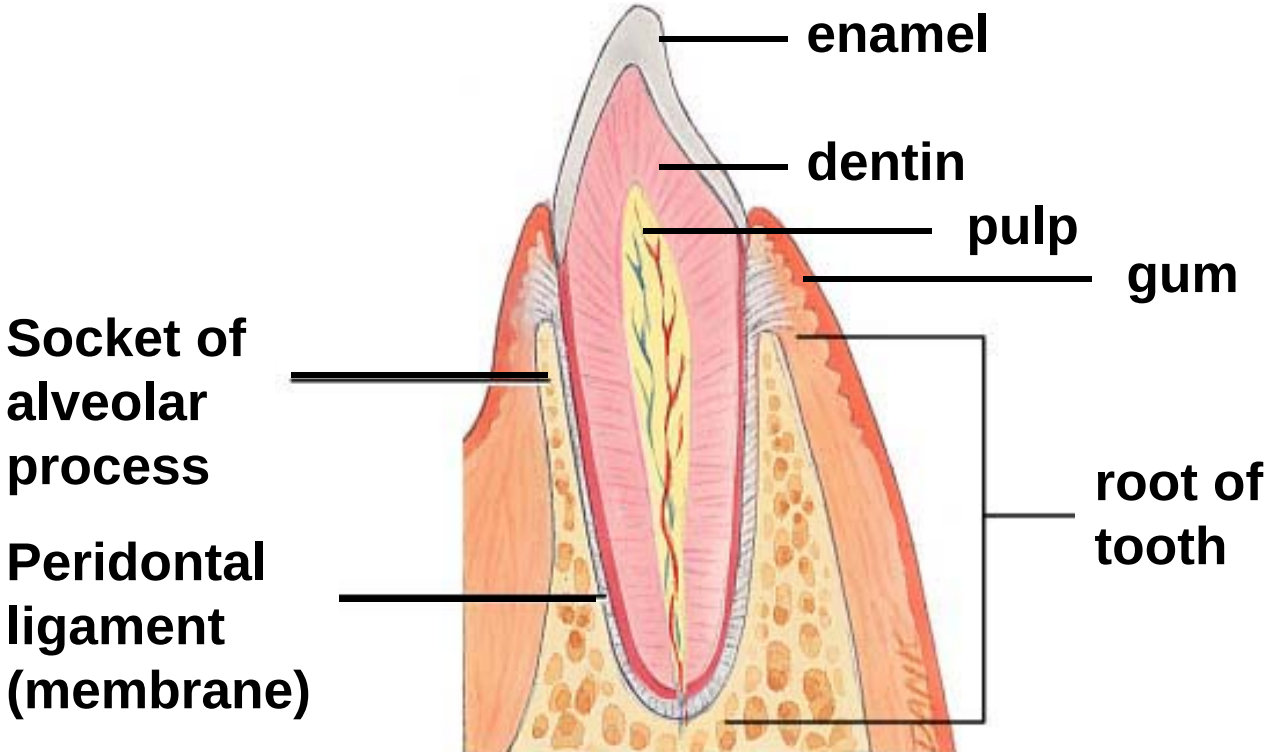
Fibrous Joints

Immovable Joints (synarthrosis)

Interosseous membrane (syndesmosis)

- Bones united by ligament

Gomphosis



- Ligaments hold tooth in bony socket
- Immovable joint

Cartilagenous Joints

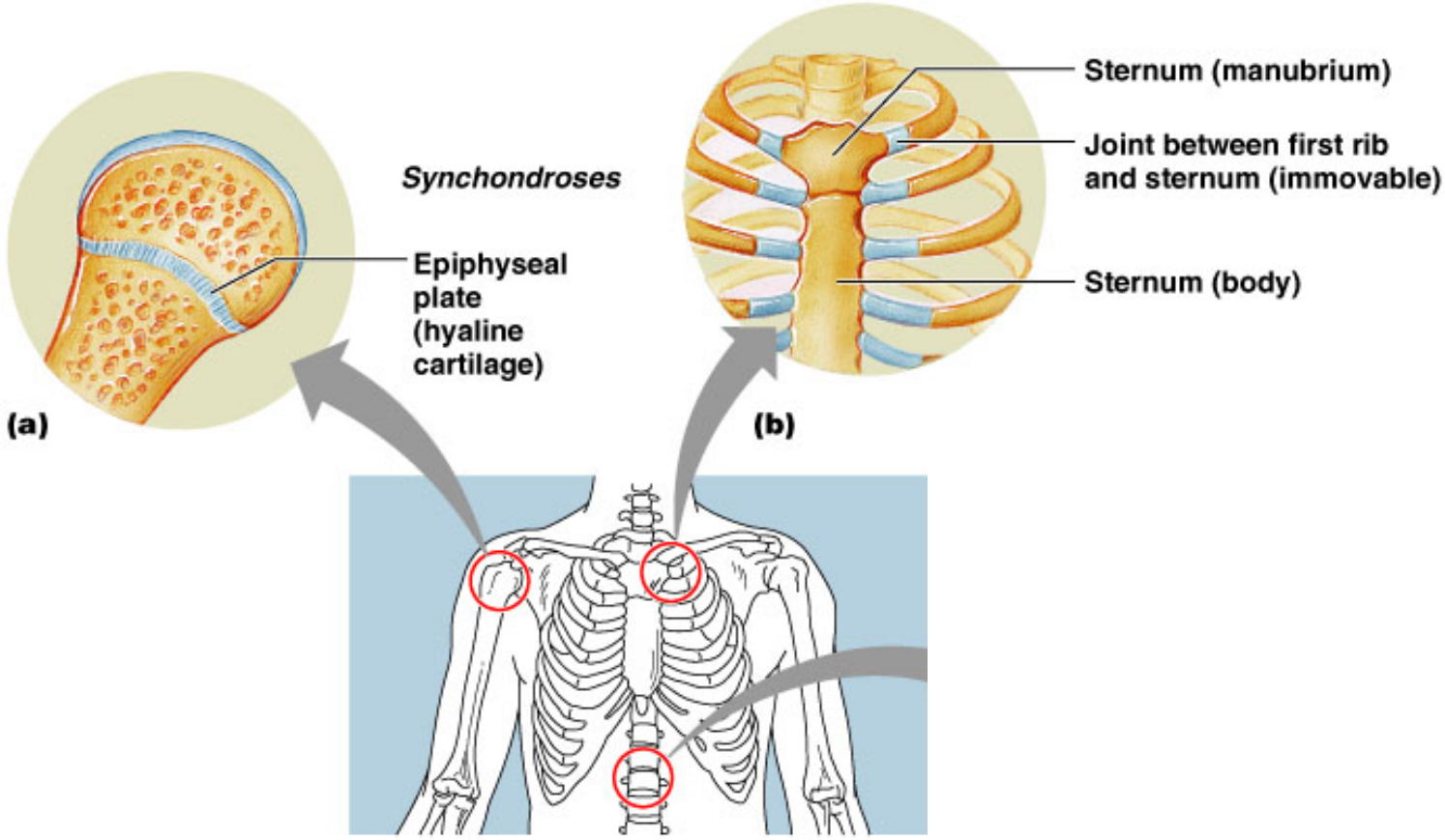
Slightly Movable (ampharthrosis) and Immovable (synarthrosis) Joints

- Lacks a synovial cavity
- Bones connected by fibrocartilage or hyaline cartilage
- 2 types
  - synchondrosis
  - symphyses

Cartilagenous Joints

Immovable Joint

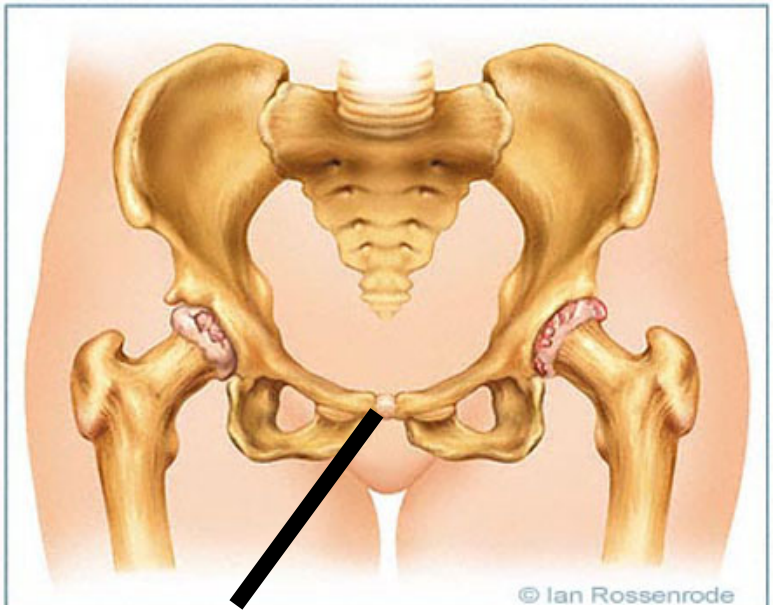
(synchondrosis)



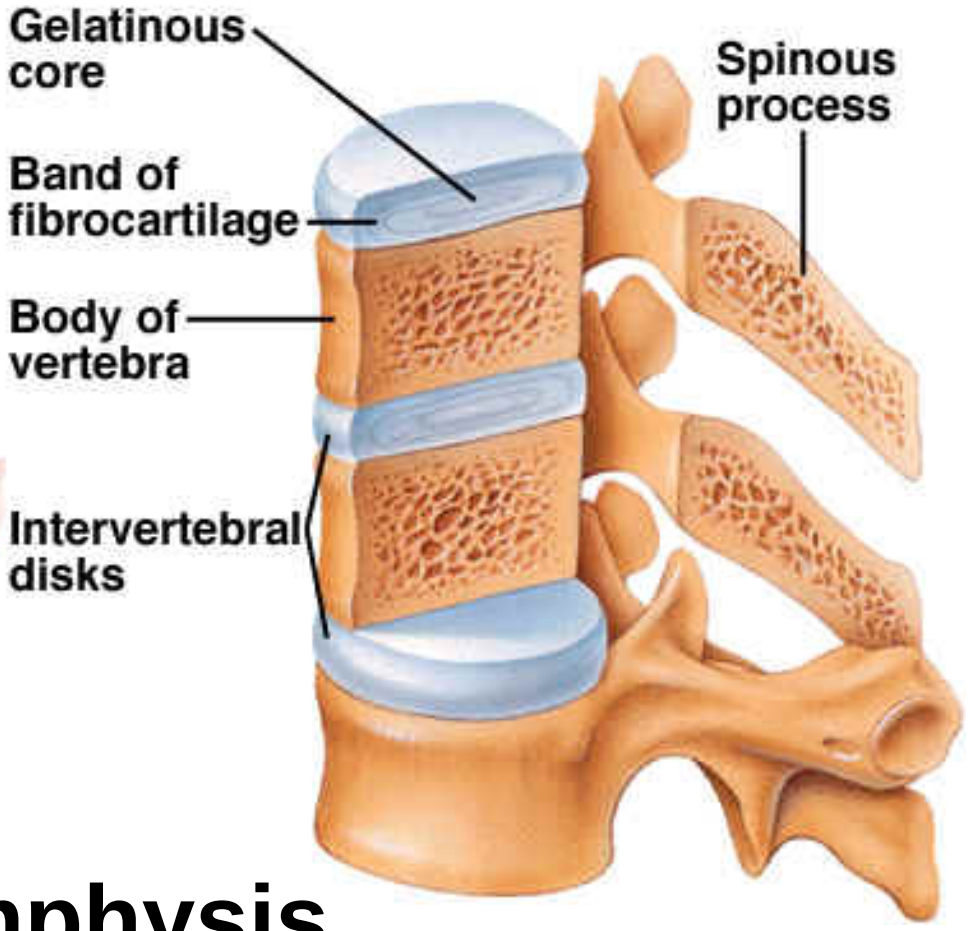
Cartilagenous Joints

Slightly Movable Joint

(ampharthrosis)



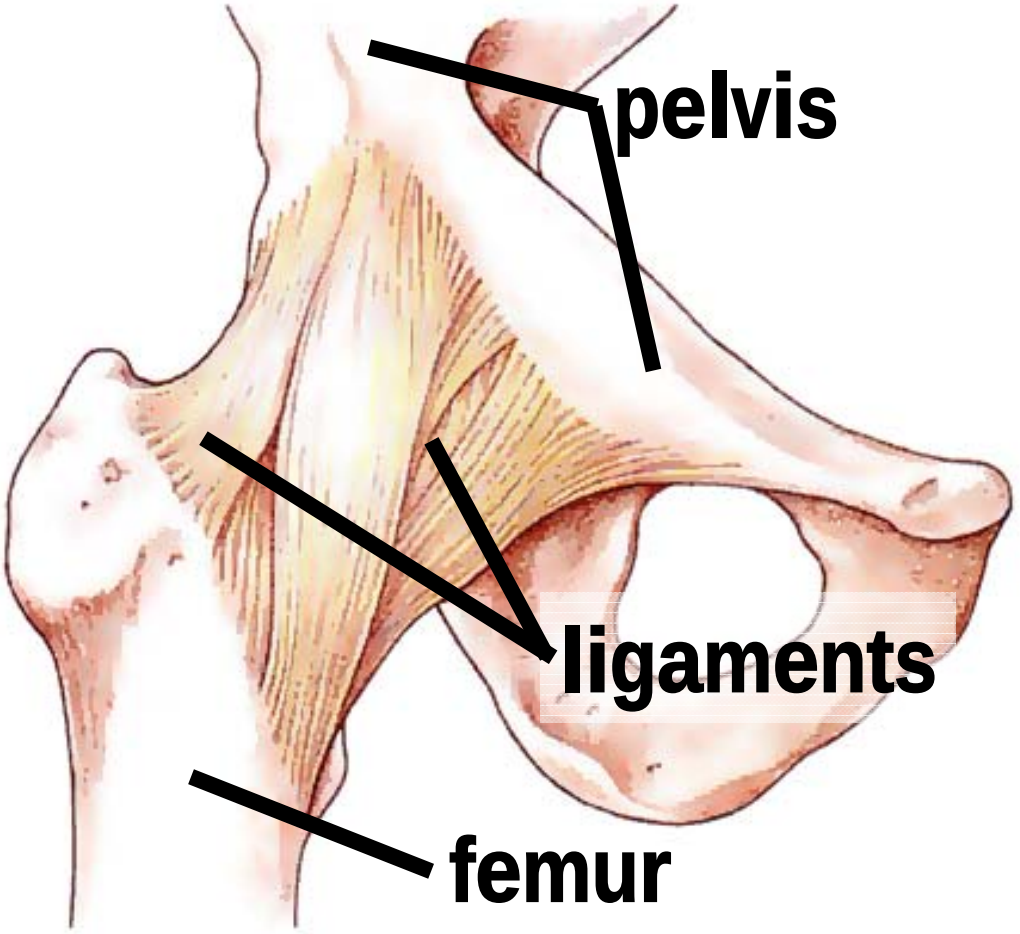
pubic symphysis



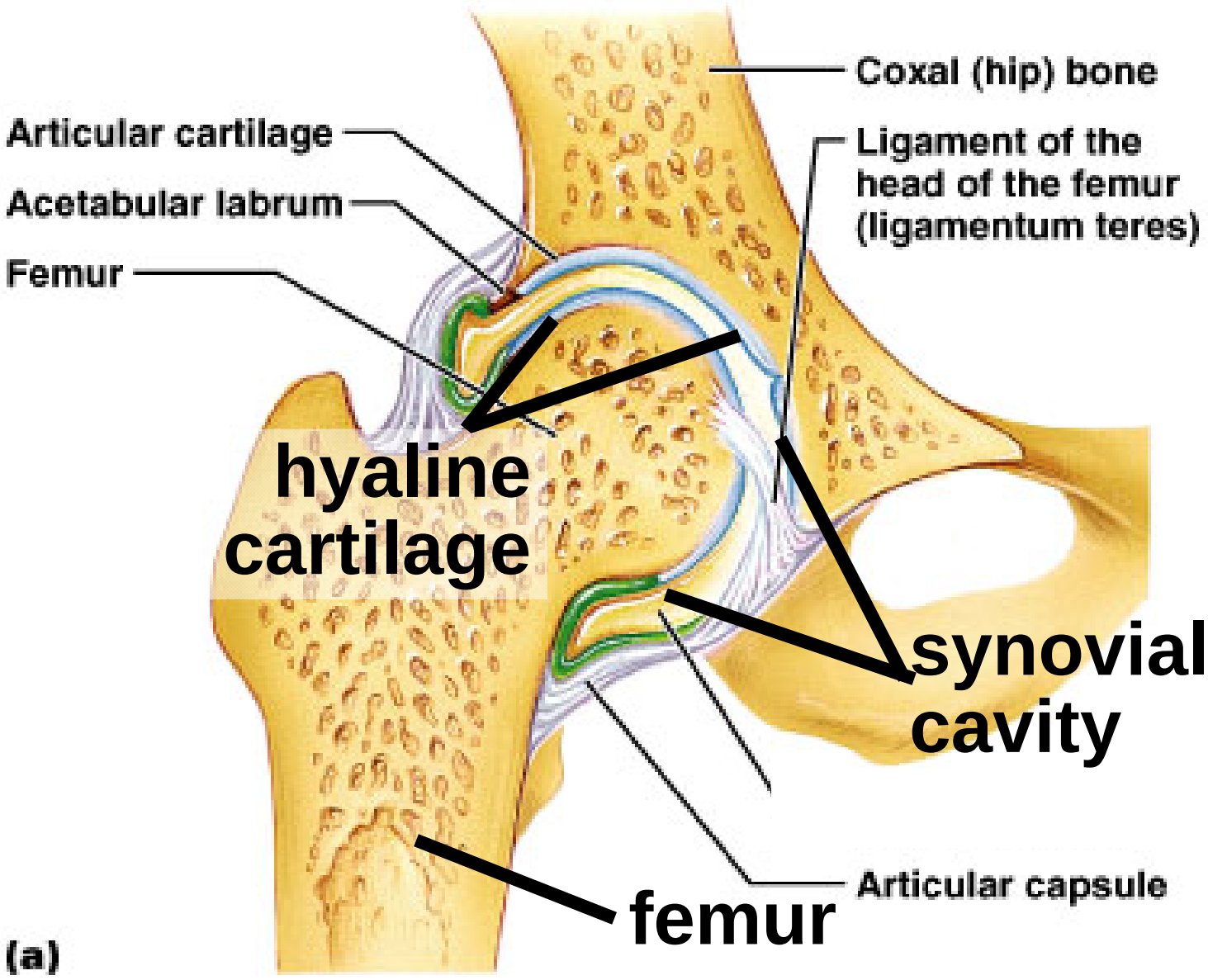
symphysis

Synovial Joints

(diarthrosis)- freely moveable

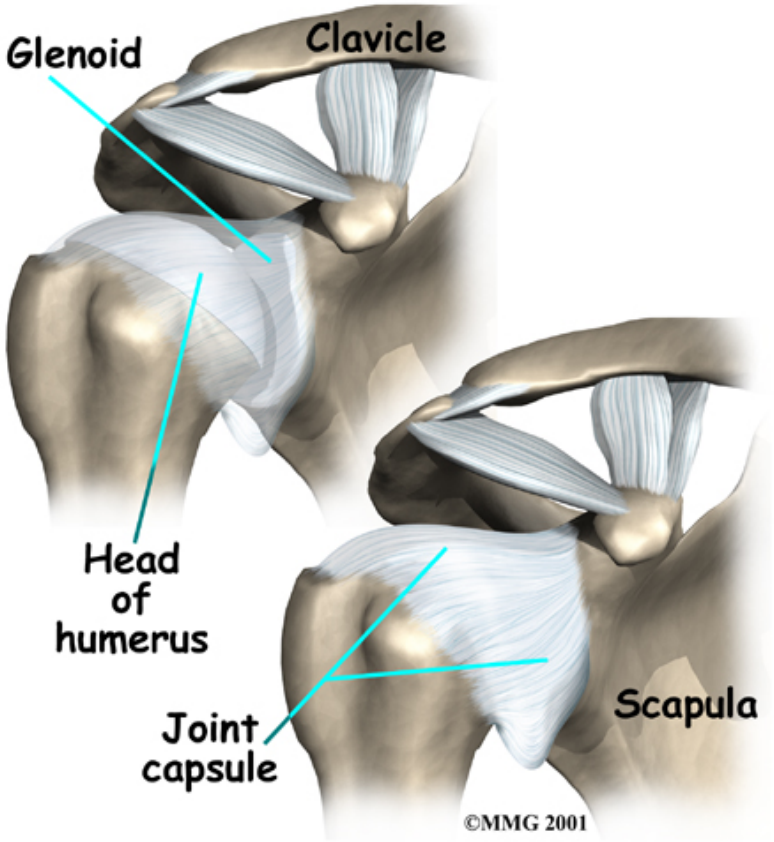


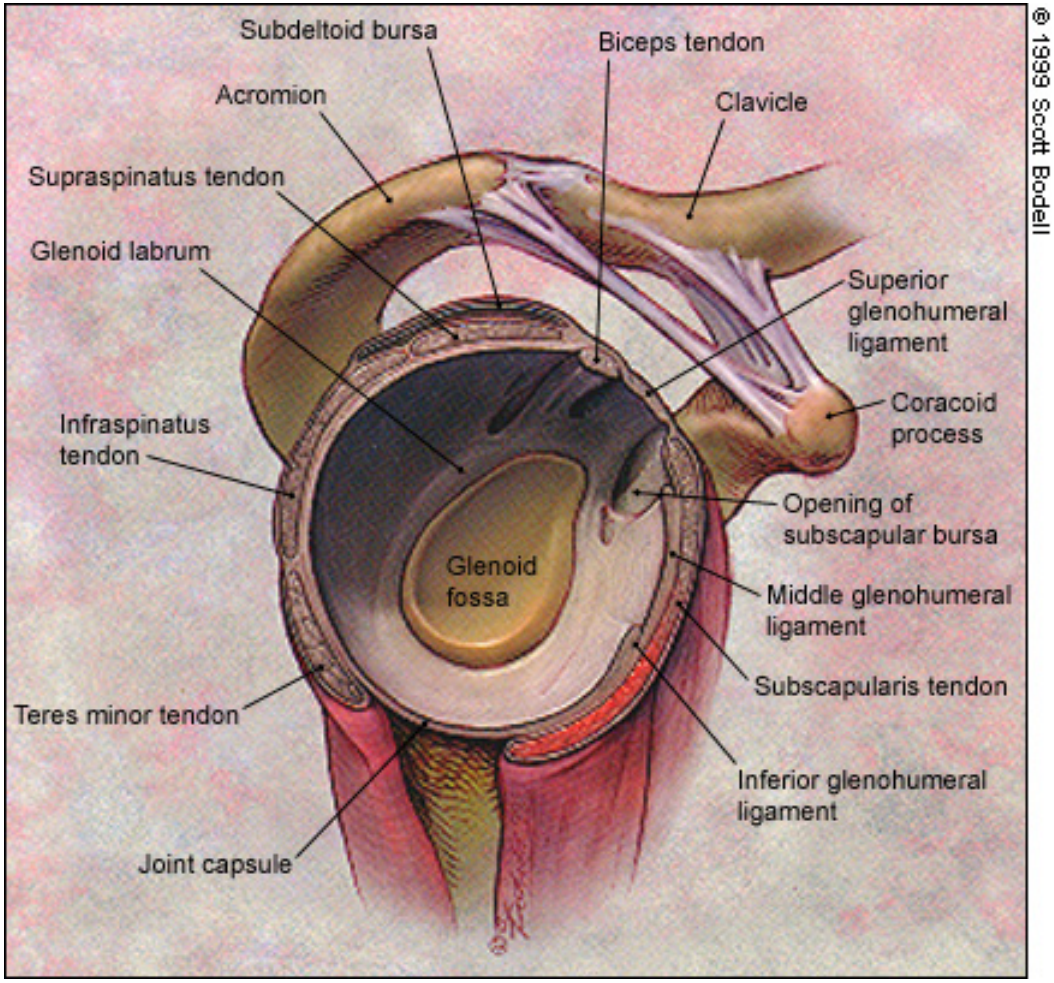
Synovial Joints



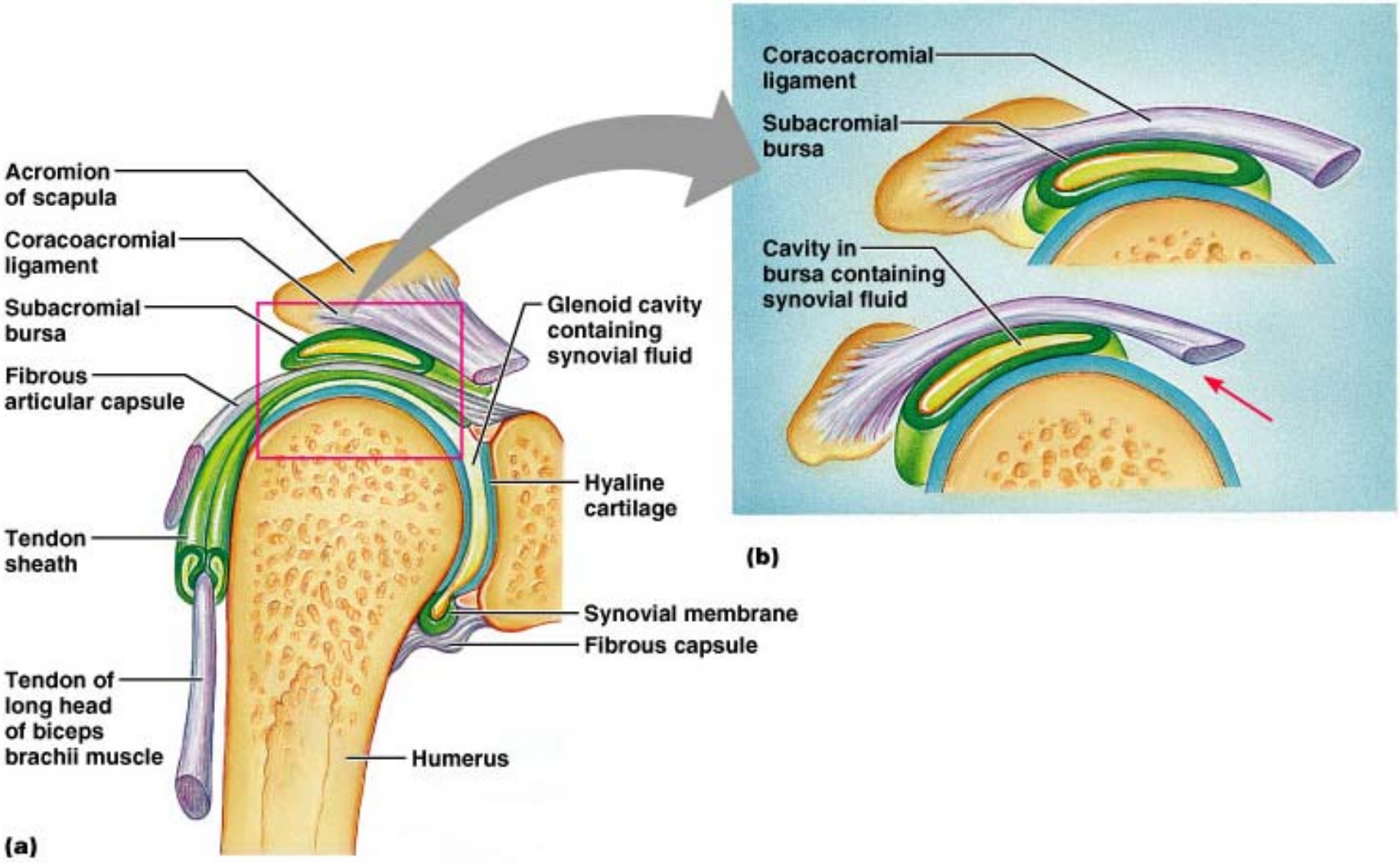
Synovial Joints

Shoulder joint

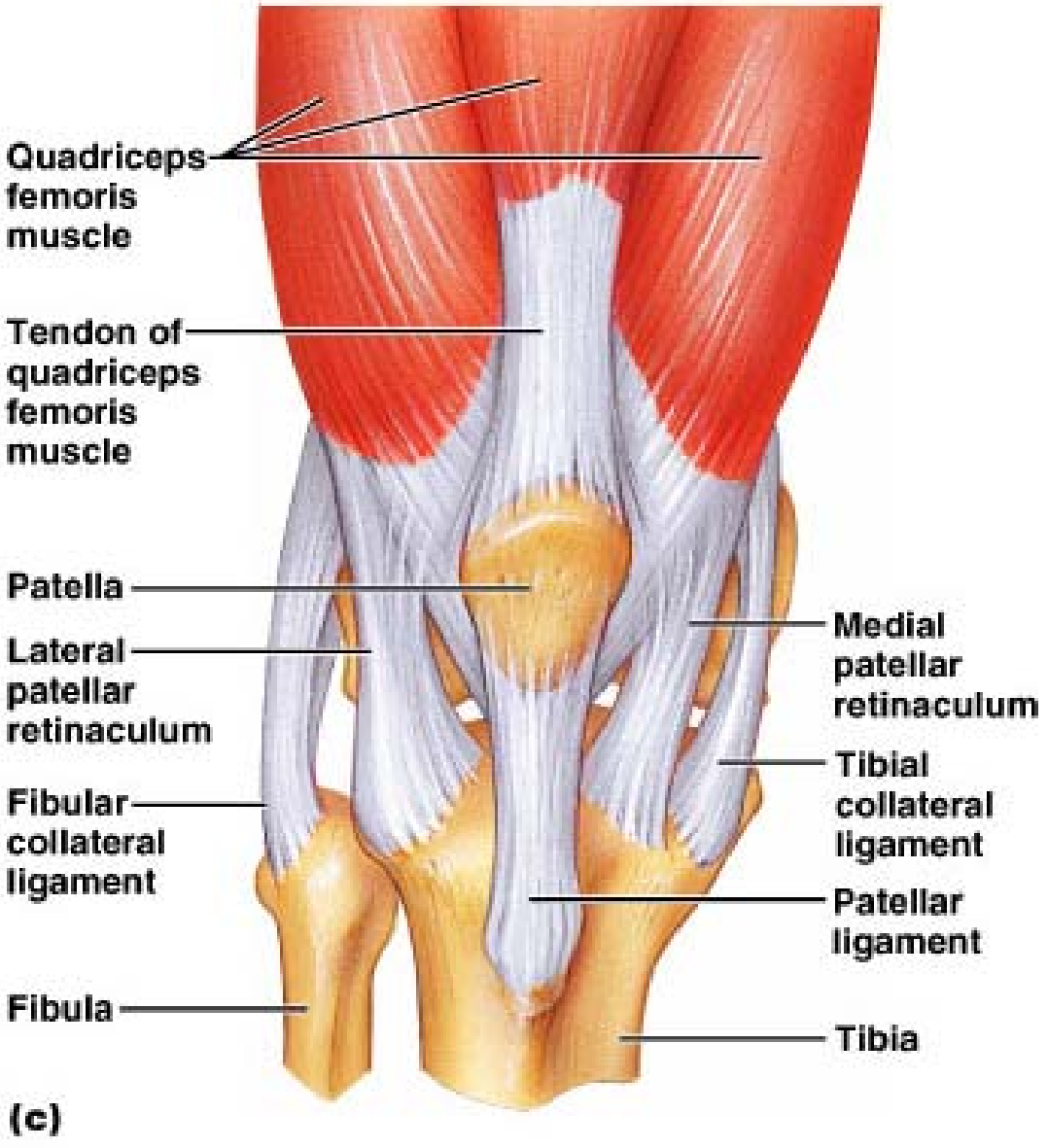




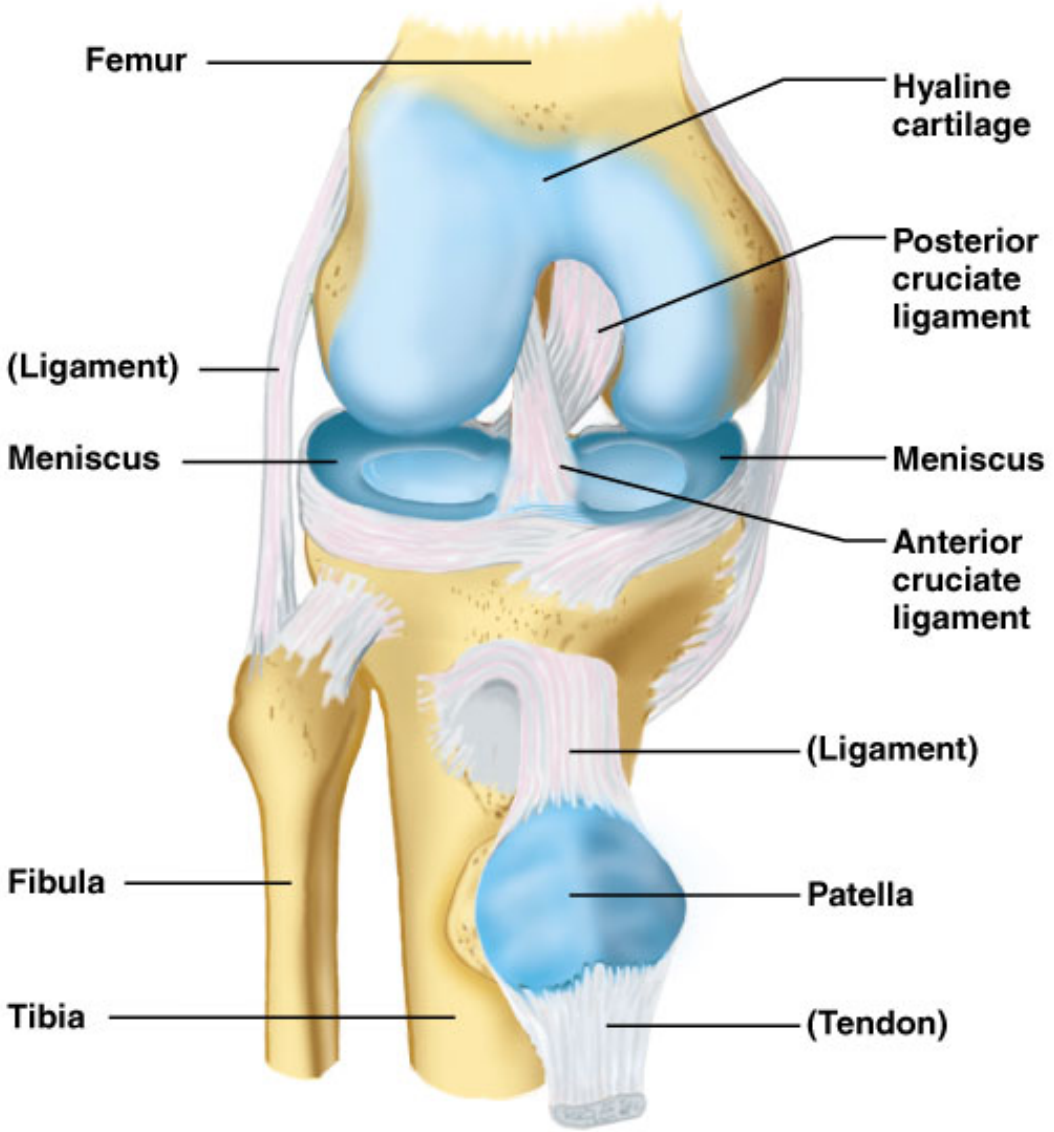
Shoulder joint



Knee Joint


Quadriceps femoris muscle
Tendon of quadriceps femoris muscle
Patella
Lateral patellar retinaculum
Fibular collateral ligament
Fibula
Medial patellar retinaculum
Tibial collateral ligament
Patellar ligament
Tibia
(c)

Knee Joint



(a)

Knee Joint

Cruciate Ligaments

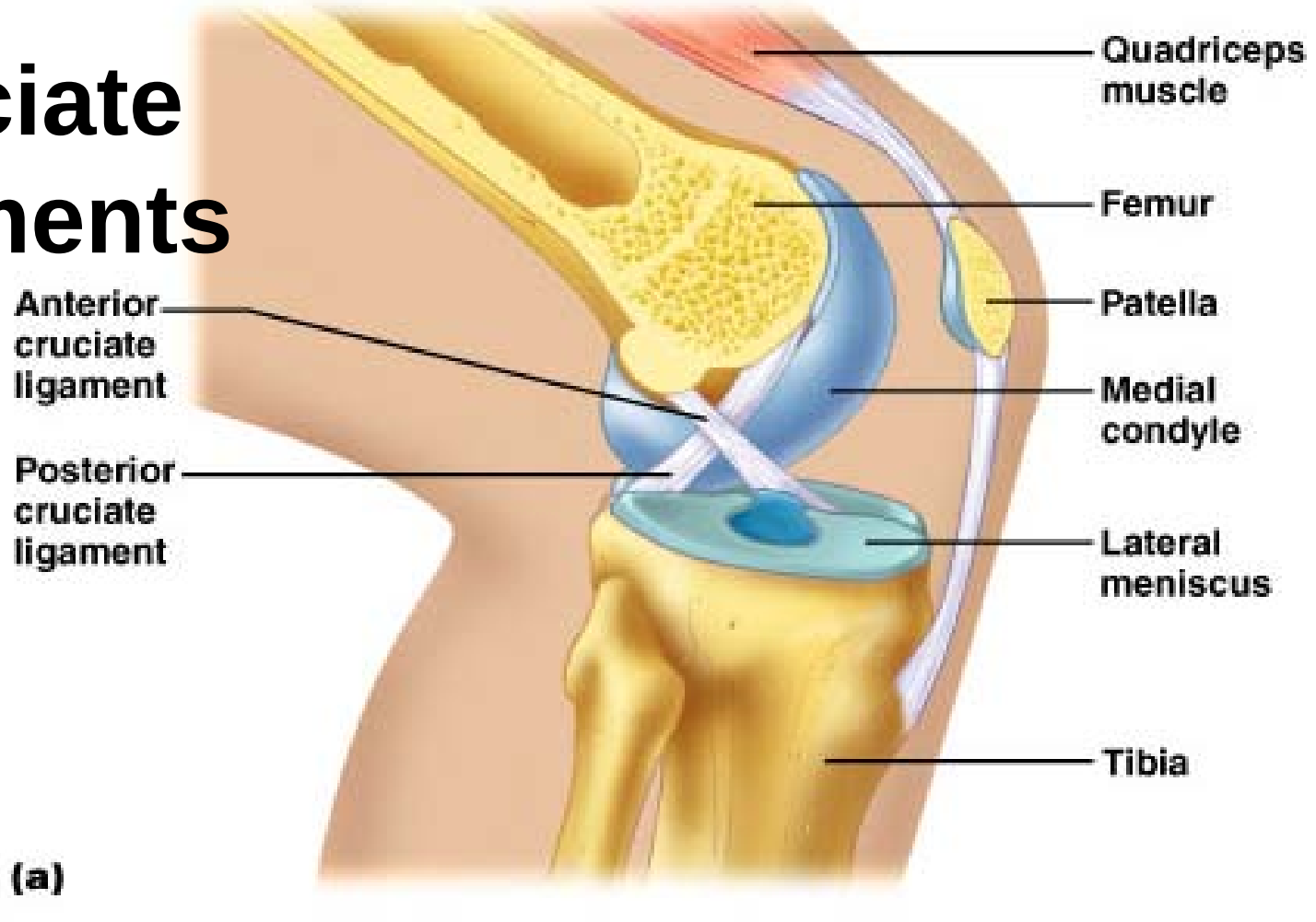
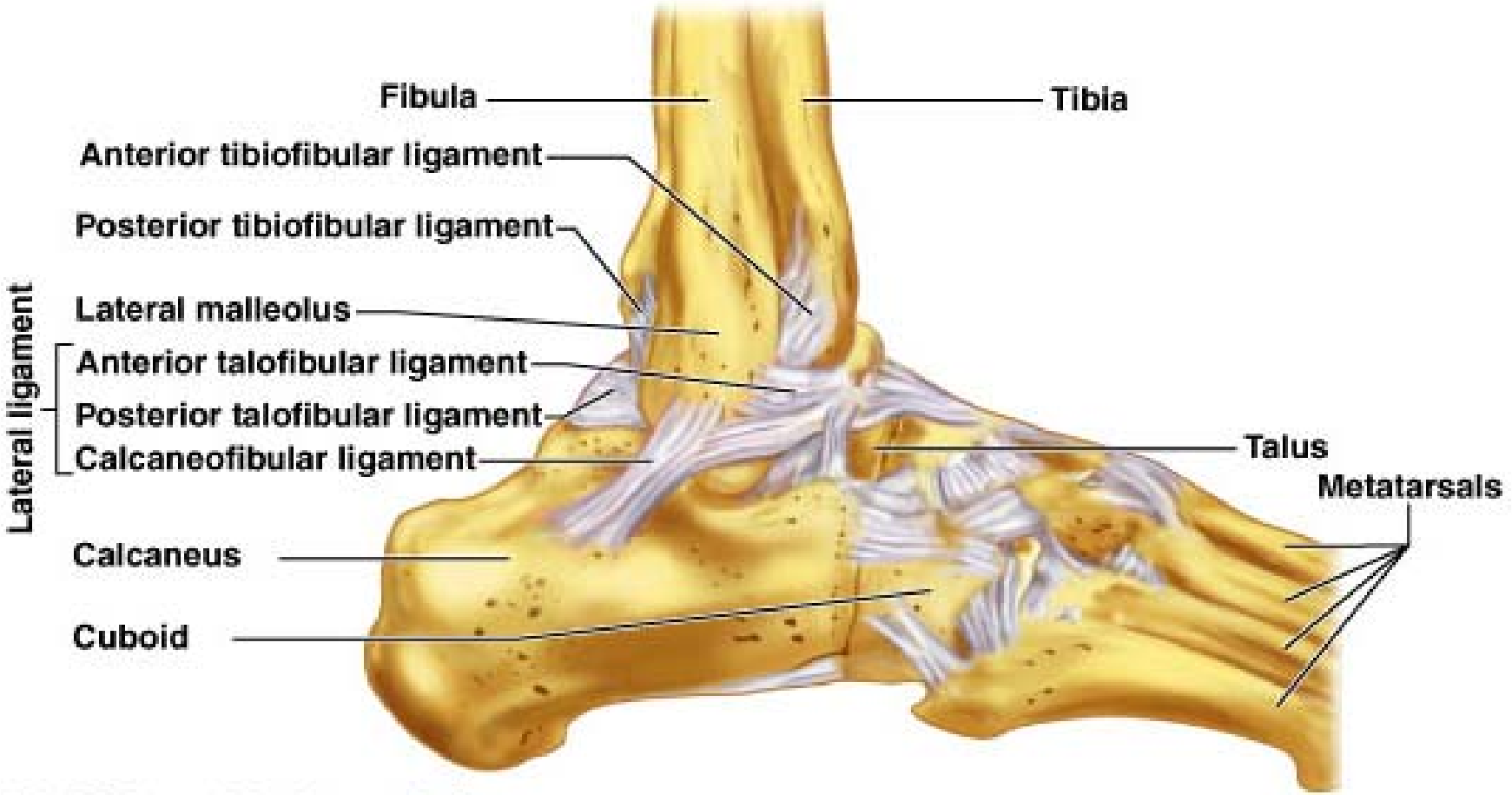


Fig. 9.13 The cruciate ligaments prevent undesirable movements at the knee joint. a) when the knee is flexed or extended, the anterior cruciate prevents anterior slipping movements of the tibia

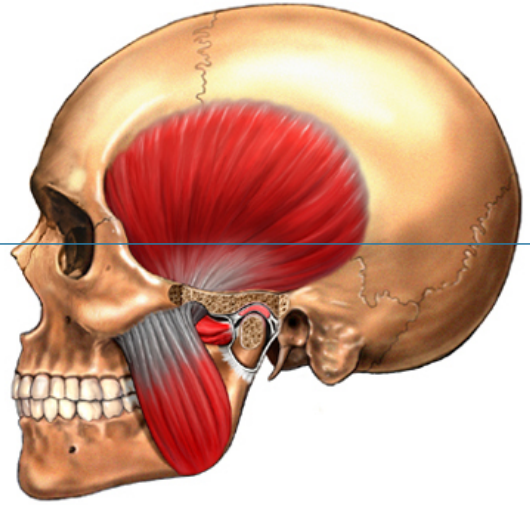
Ankle Joint

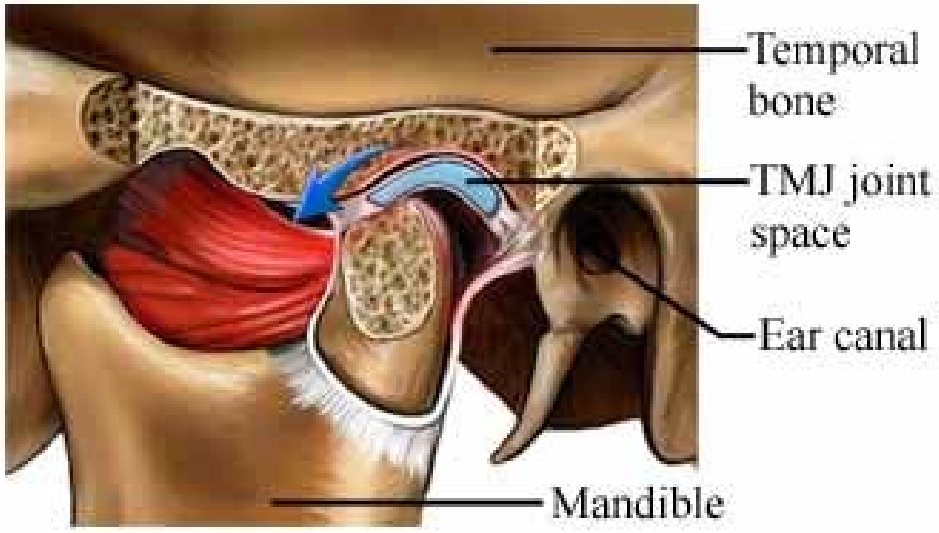


(c) Right ankle, lateral view

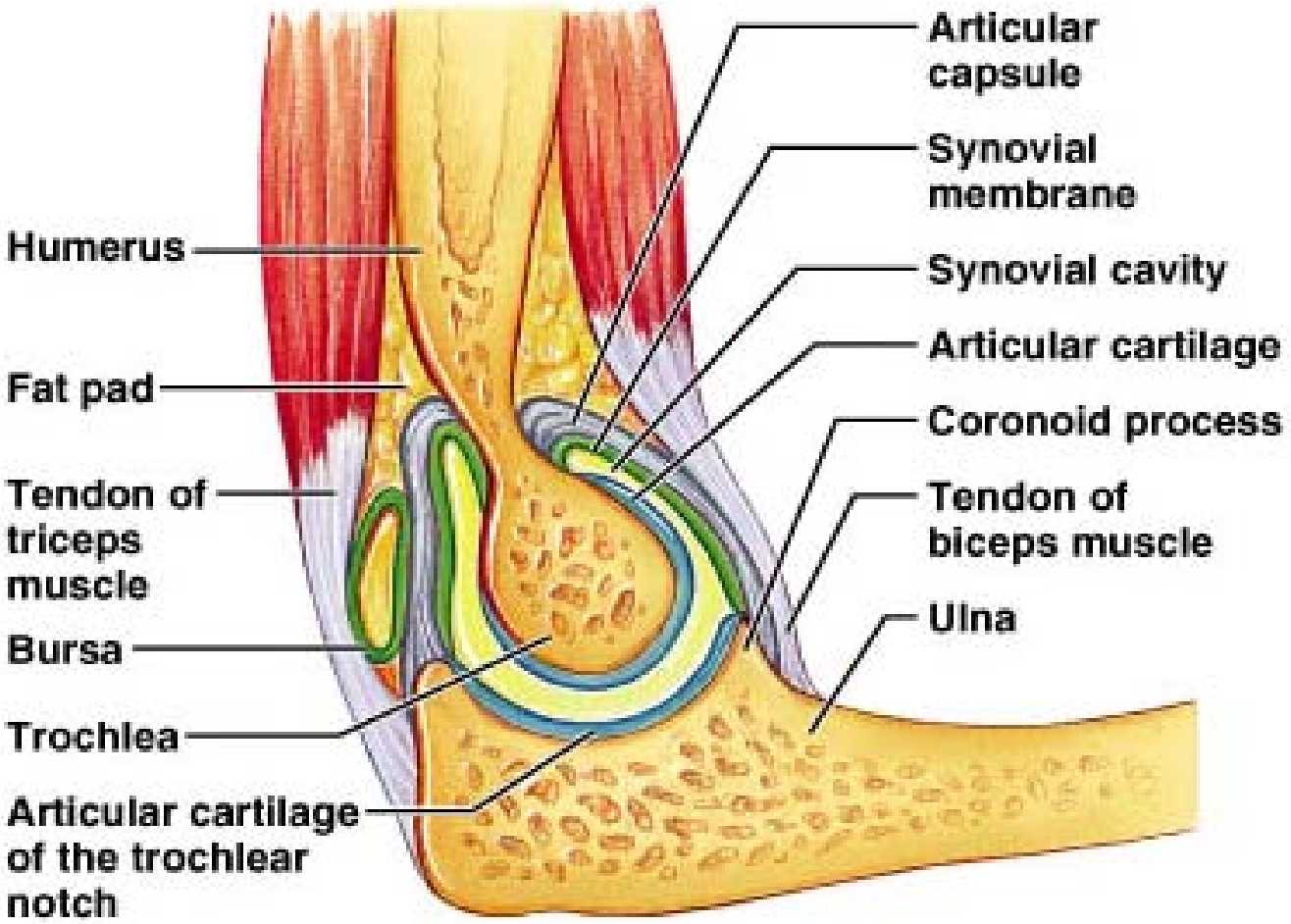
Temporomandibular Joint

- Complex Joint
- Articular disc
- Gliding above disc
- Hinge below disc
- Movements:
  - depression
  - elevation
  - protraction
  - retraction





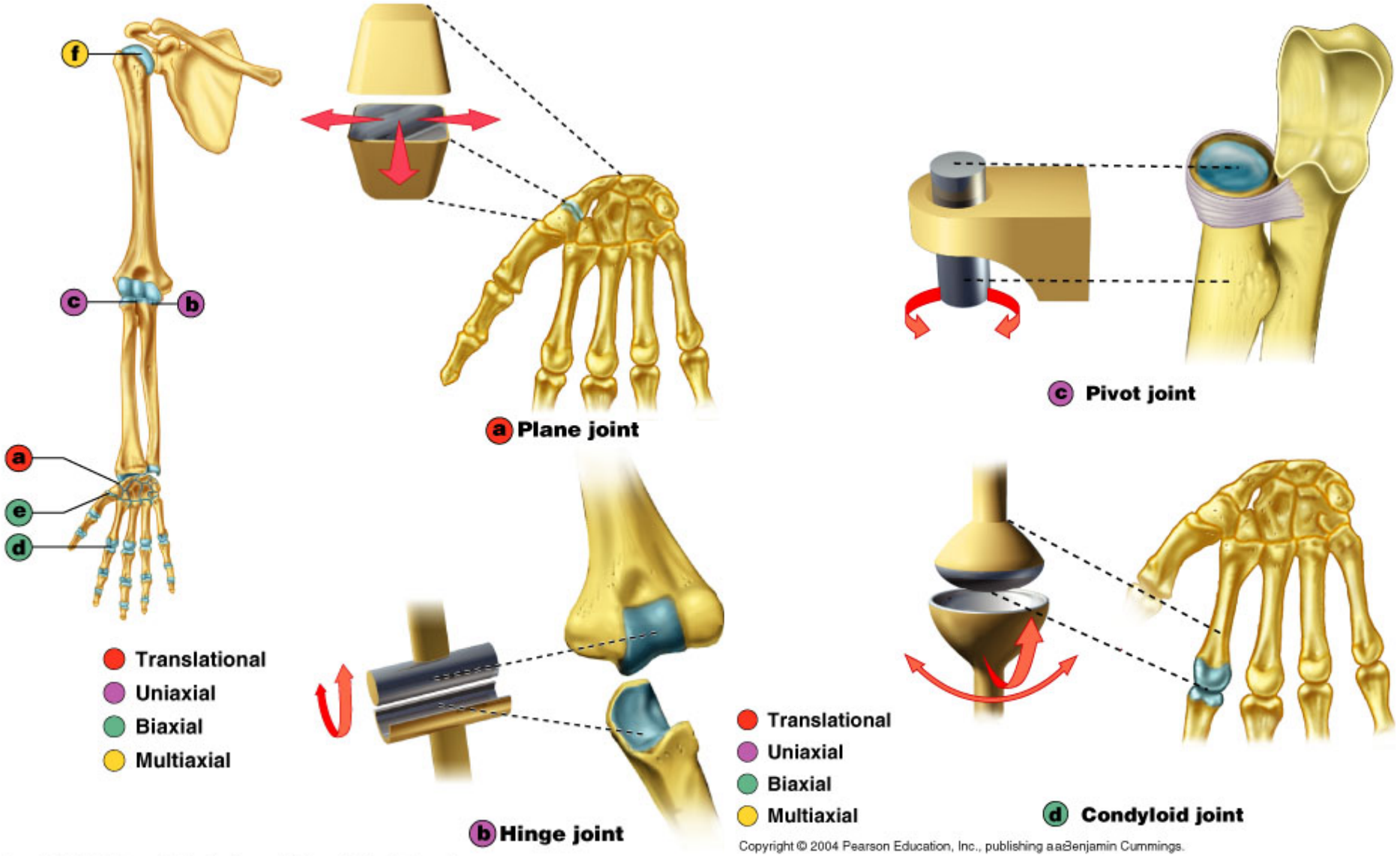
Elbow


Articular capsule
Synovial membrane
Synovial cavity
Articular cartilage
Coronoid process
Tendon of biceps muscle
Ulna
Humerus
Fat pad
Tendon of triceps muscle
Bursa
Trochlea
Articular cartilage of the trochlear notch
(a)

Types of Synovial Joints

- Planar Joint
- Hinge Joint
- Pivot Joint
- Saddle Joint
- Ball & Socket Joint
- Condyloid or Ellipsoid Joint

Types of Synovial Joints



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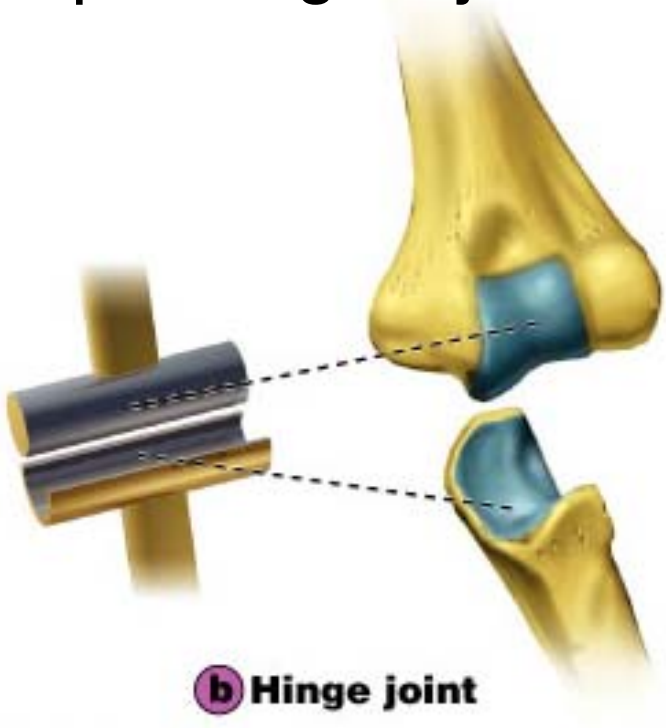
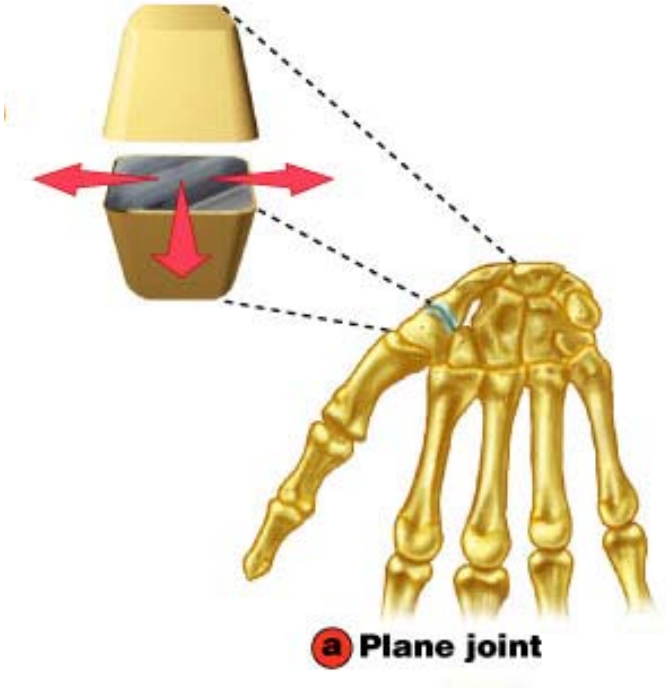
Hinge Joint

- Convex surface of bone fits in concave surface of 2nd bone
- Unixlateral like a door hinge
- Examples:
  - Knee, elbow, ankle, interphalangeal joints
- Movements produced:
  - flexion
  - extension
  - hyperextension



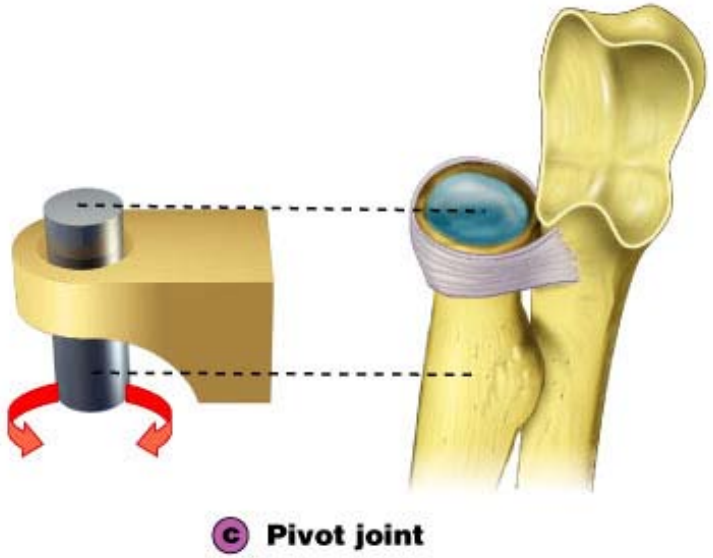
Planar Joint

- Bone surfaces are slightly curved
- Side to side movement only
- Rotation prevented by ligaments
- Examples:
  - intercarpal to intertarsal joints
  - sternoclavicular joint
  - vertebrocostal joints



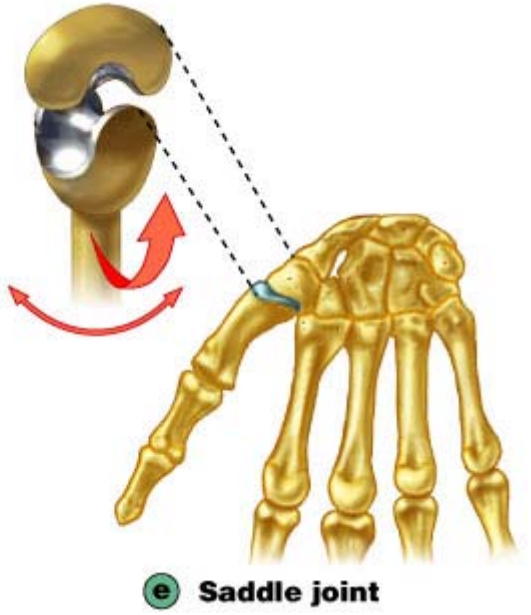
Pivot Joint

- Rounded surface of bone articulates with the ring formed by the 2nd bone & ligament
- Monoaxial since it only allows rotation around longitudinal axis
- Examples:
  - proximal radioulnar joint
    - supination
    - pronation
  - atlanto-axial joint
    - Turning head side to side “no”



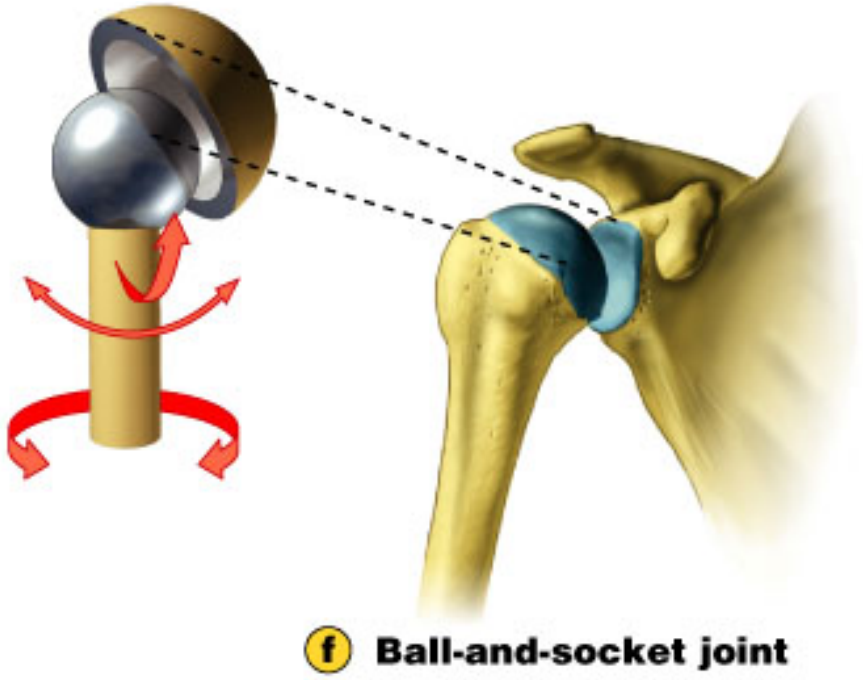
Saddle Joint

- One bone saddle-shaped, other bone fits like a person riding on the saddle
- Biaxial
  - circumduction allows the tip of the thumb to travel in a circle
  - Opposition allows thumb to touch tip of other fingers
- Examples:
  - Trapezium of carpus and metacarple of thumb



Ball & Socket Joint

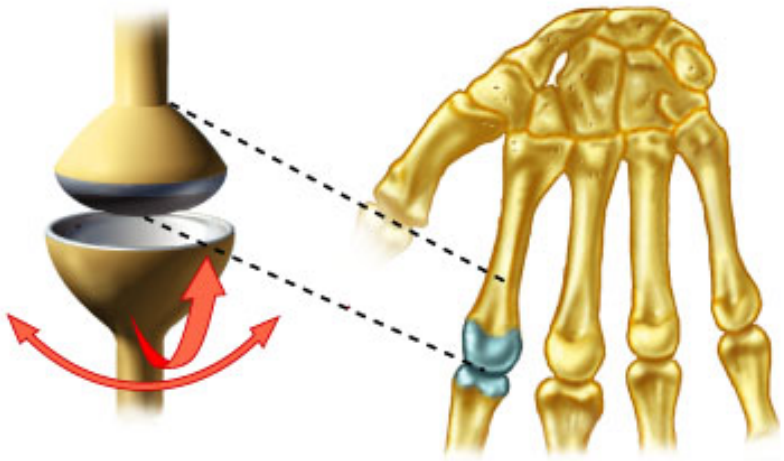
- Ball fitting into a cup-like depression
- Multiaxial
  - flexion/extension
  - abduction/adduction
  - rotation
- Examples:
  - shoulder joint
  - hip joint



(f) Ball-and-socket joint

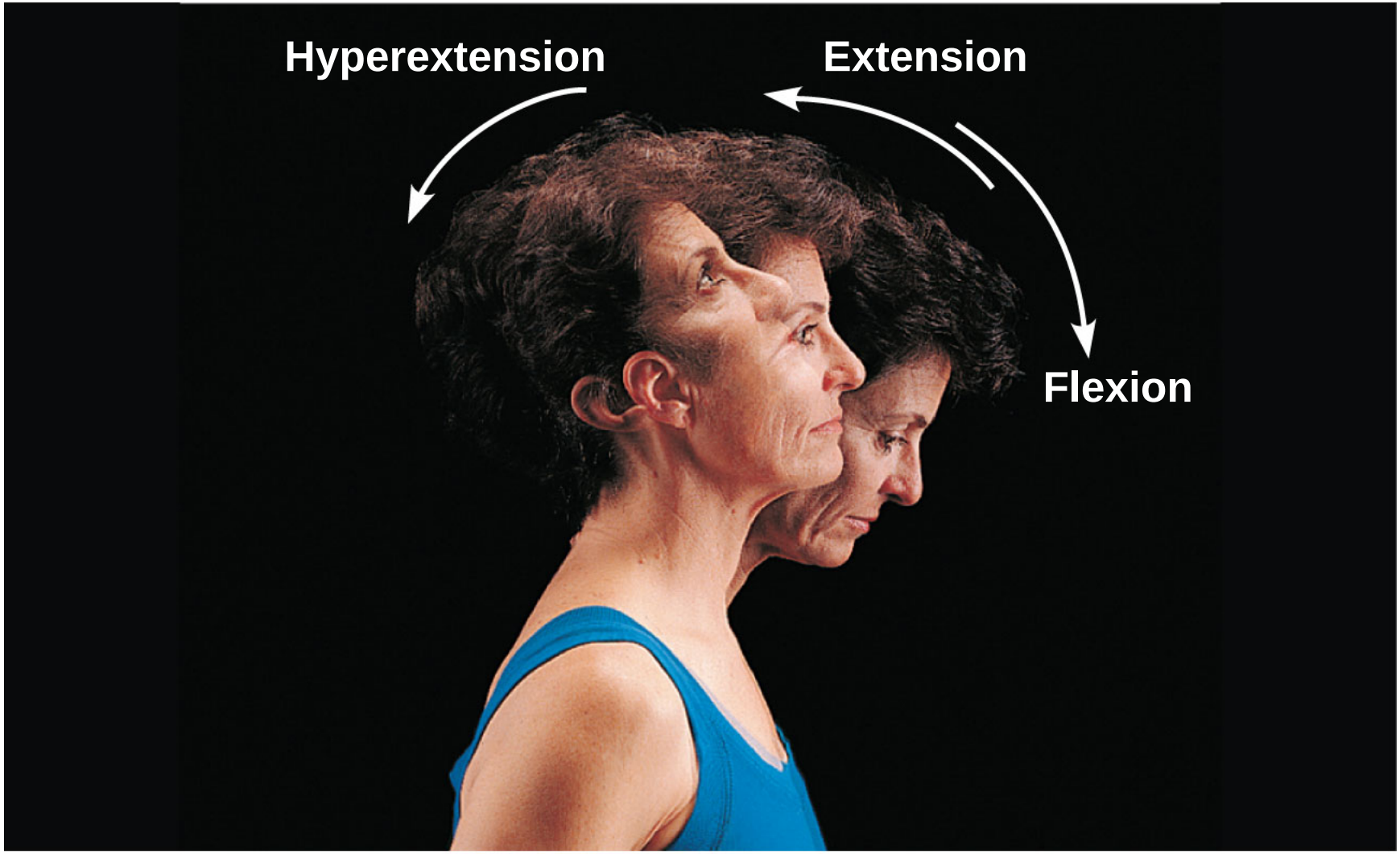
Condyloid Joint

- Oval-shaped depression fits into oval depression
- Biaxial= flex/extend or adduct/abduct is possible
- Examples:
  - Wrist and metacarpophelangeal joints for 2 to 5 digits

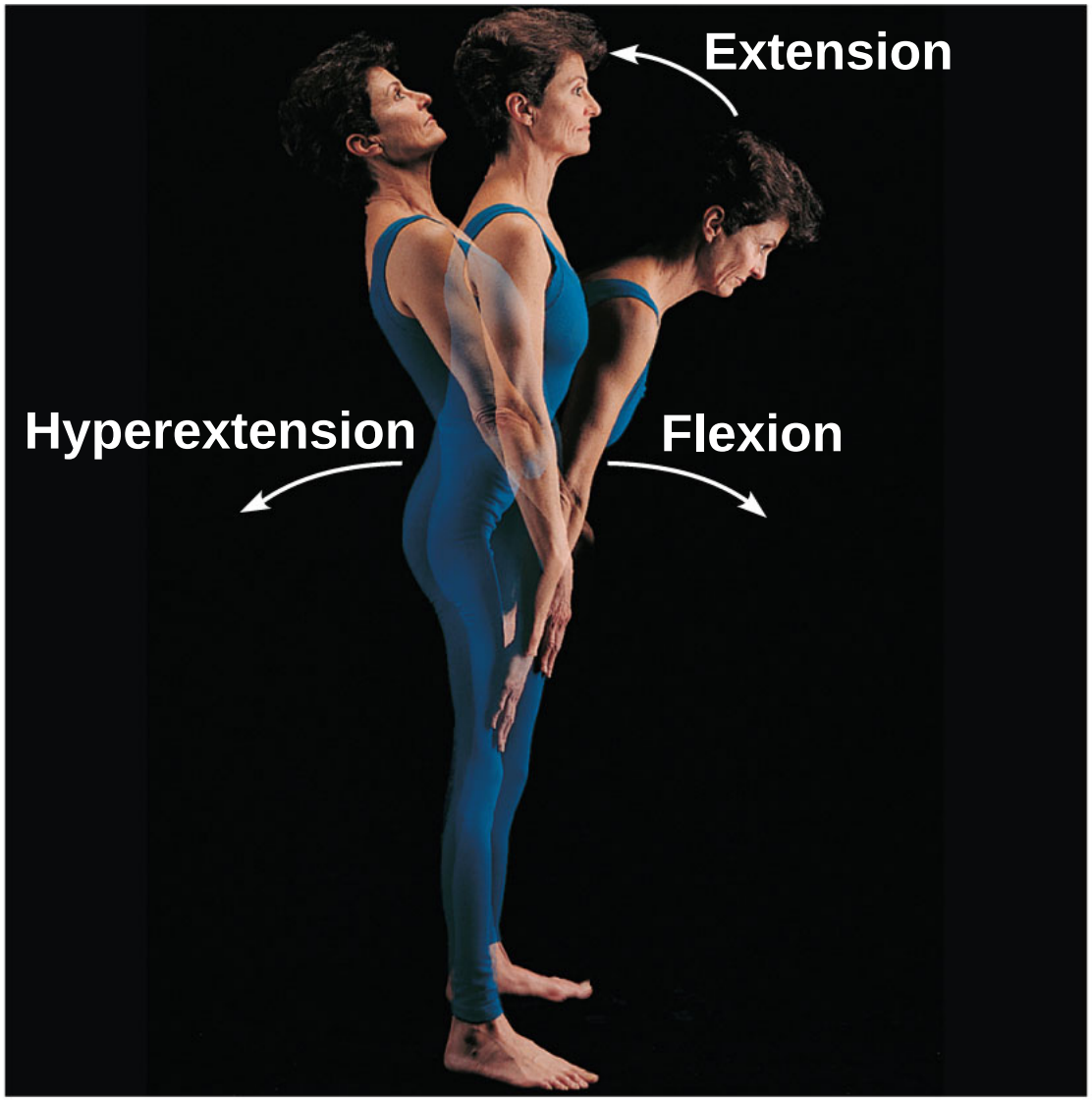


(d) Condyloid joint

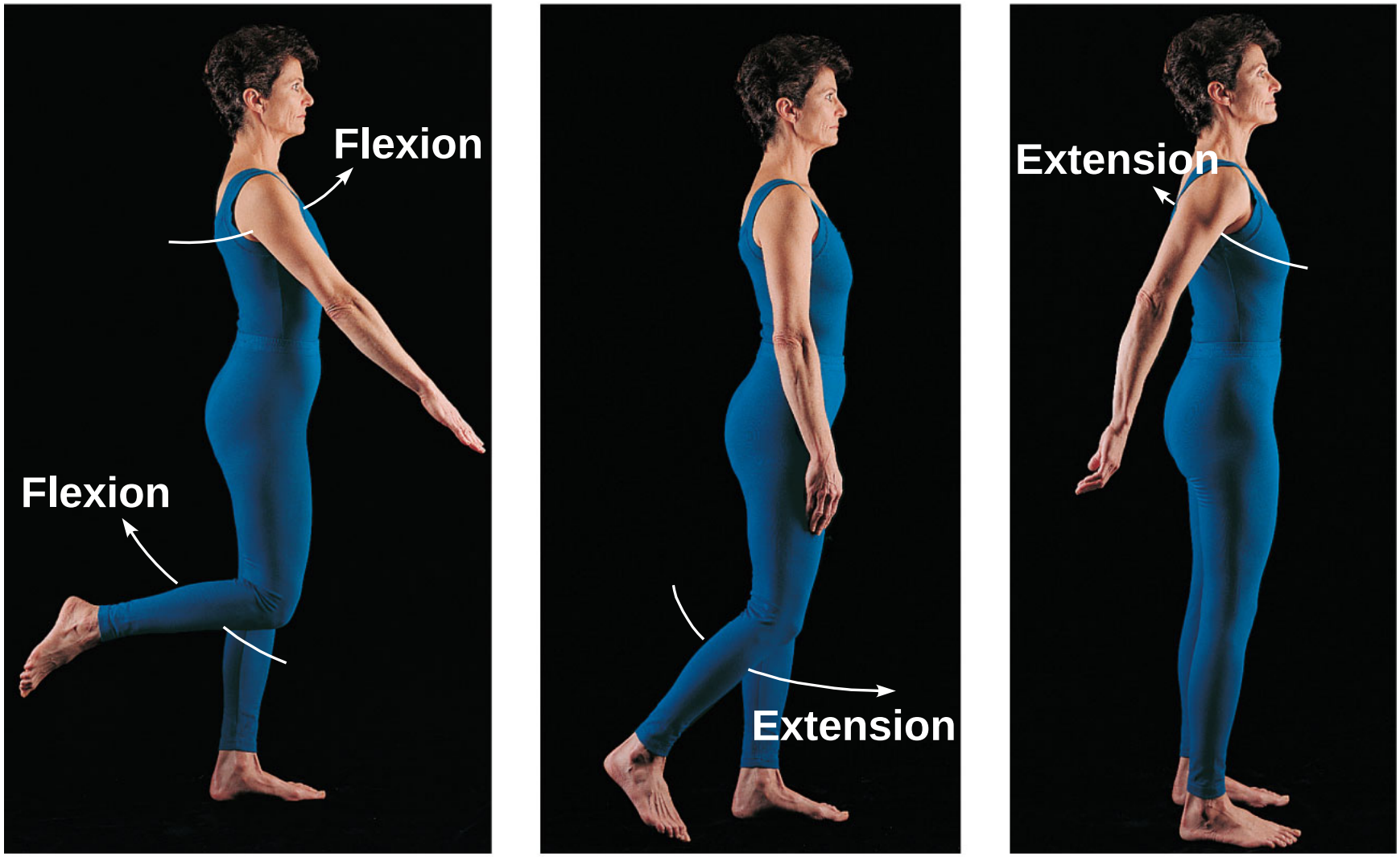
(a) Gliding movements at the wrist



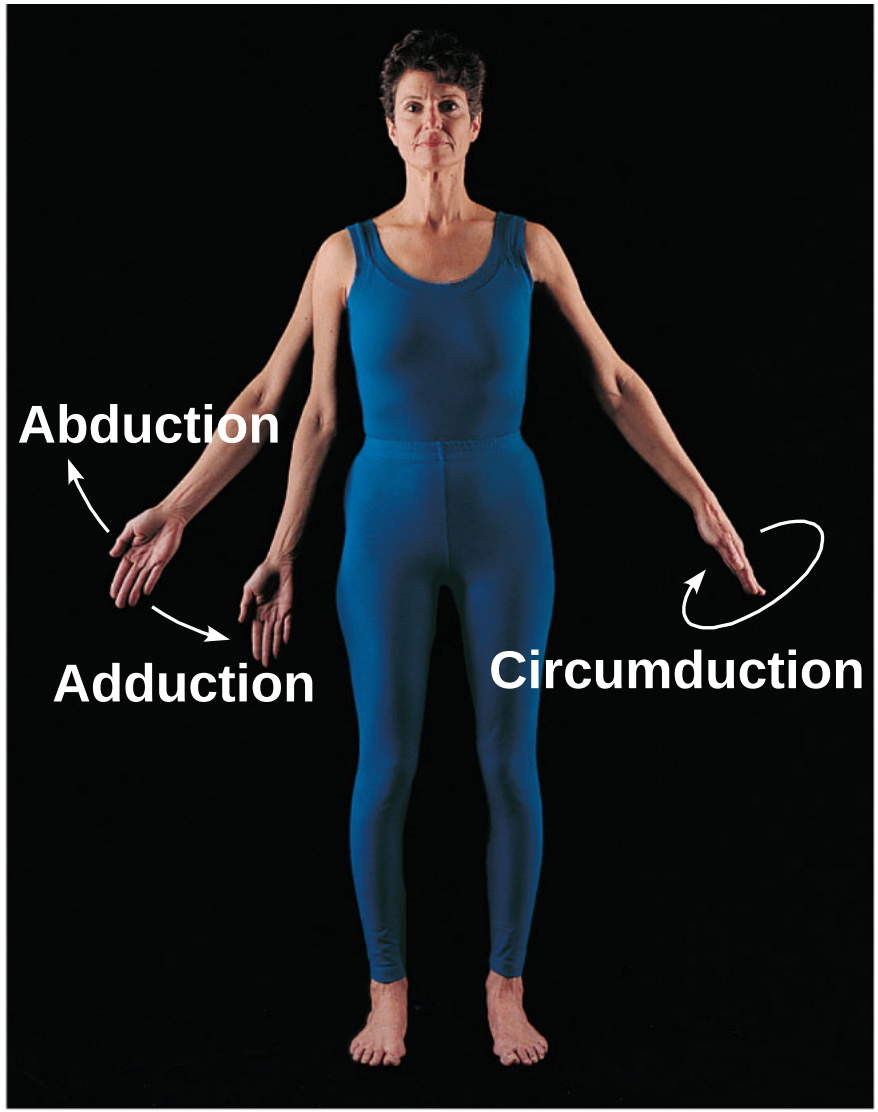
(b) Angular movements: flexion, extension, and hyperextension of the neck



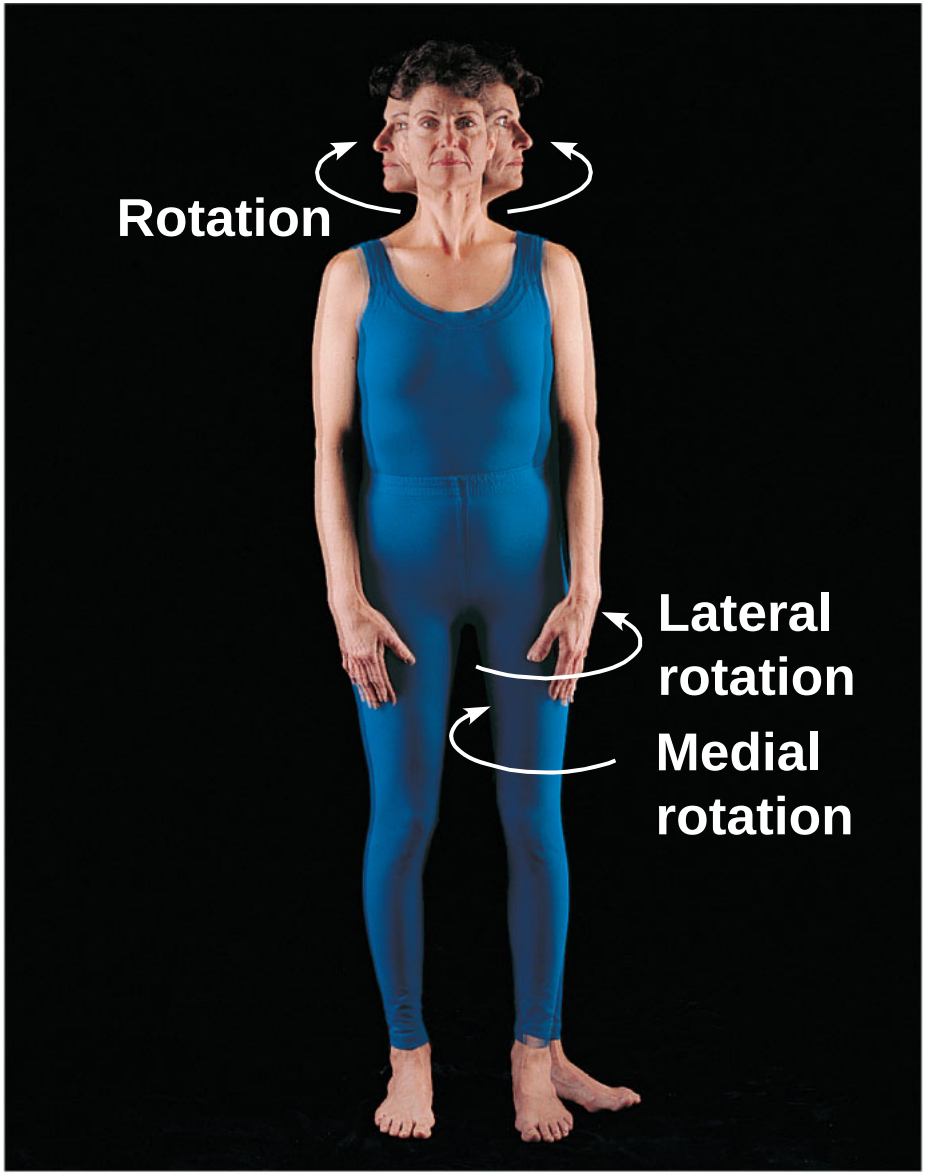
(c) Angular movements: flexion, extension, and hyperextension of the vertebral column



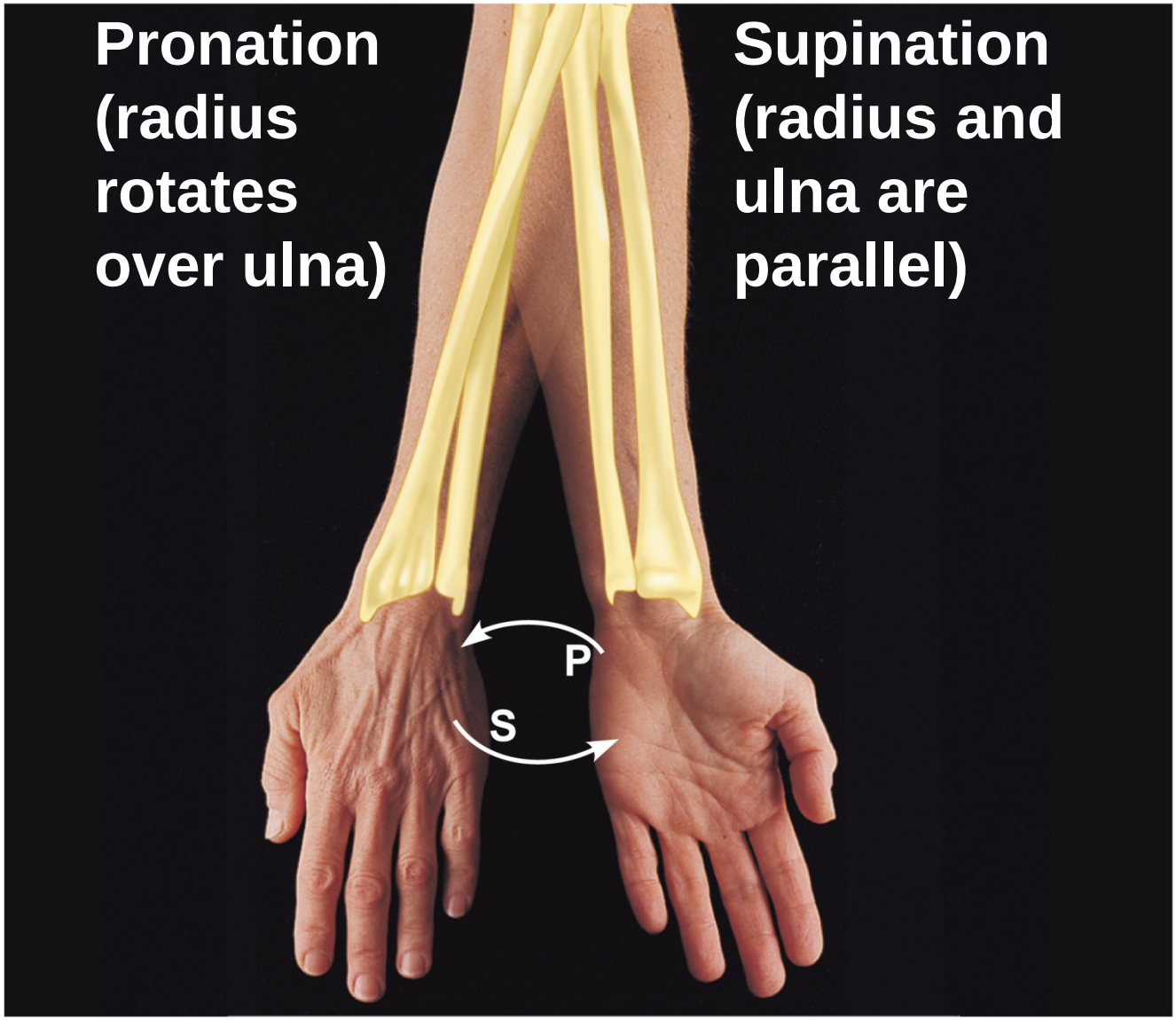
(d) Angular movements: flexion and extension at the shoulder and knee



(e) Angular movements: abduction, adduction, and circumduction of the upper limb at the shoulder

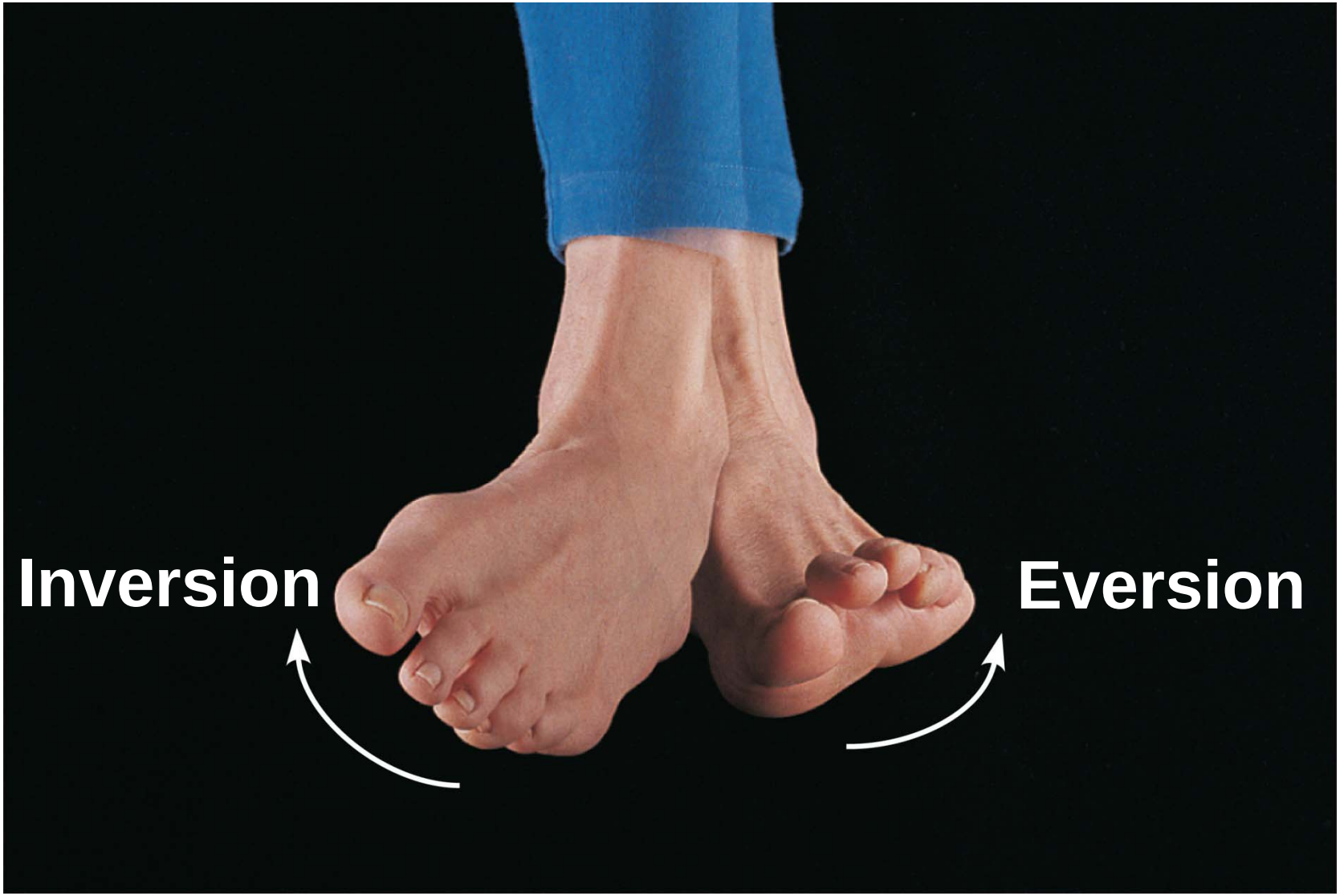


(f) Rotation of the head, neck, and lower limb

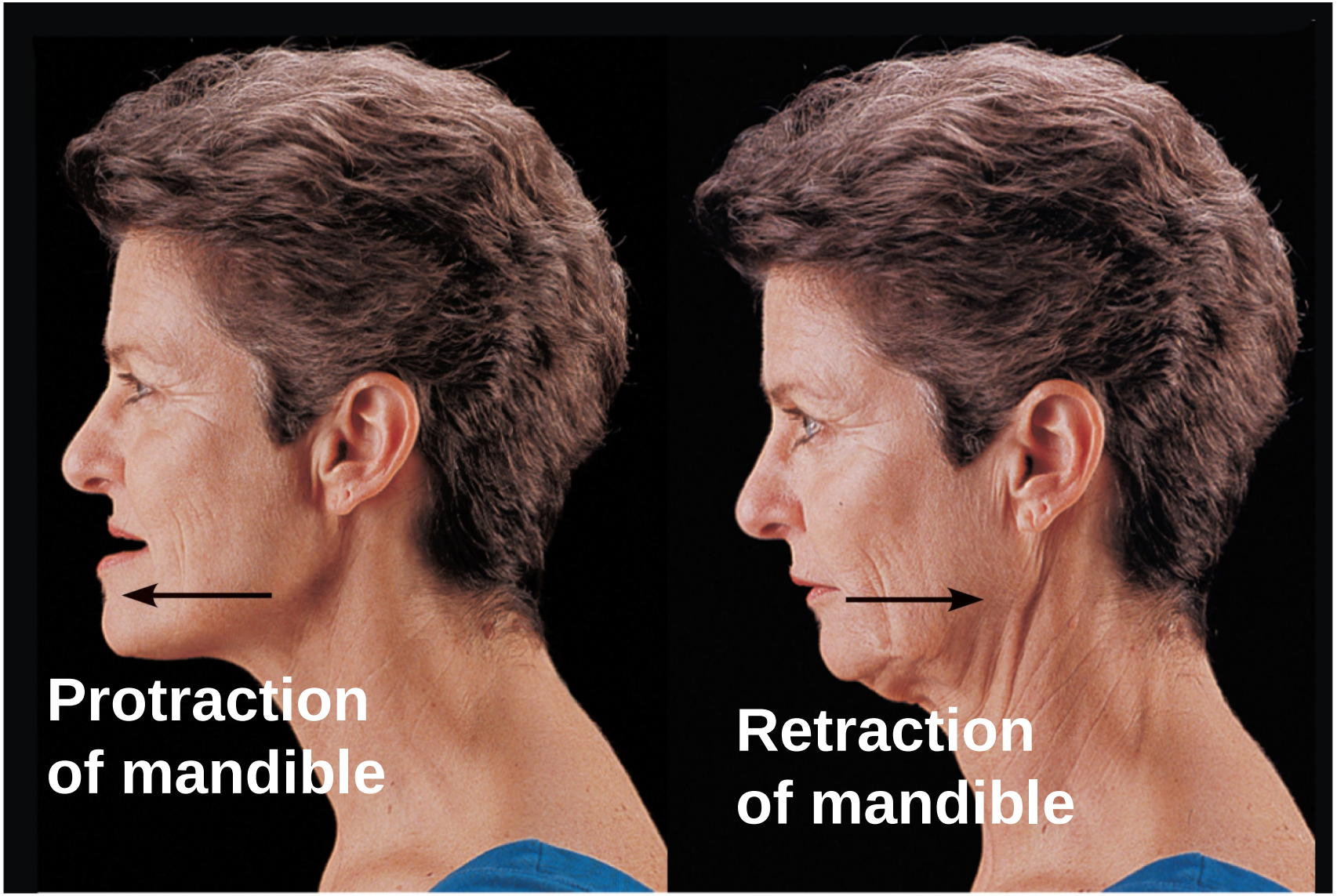


(a) Pronation (P) and supination (S)

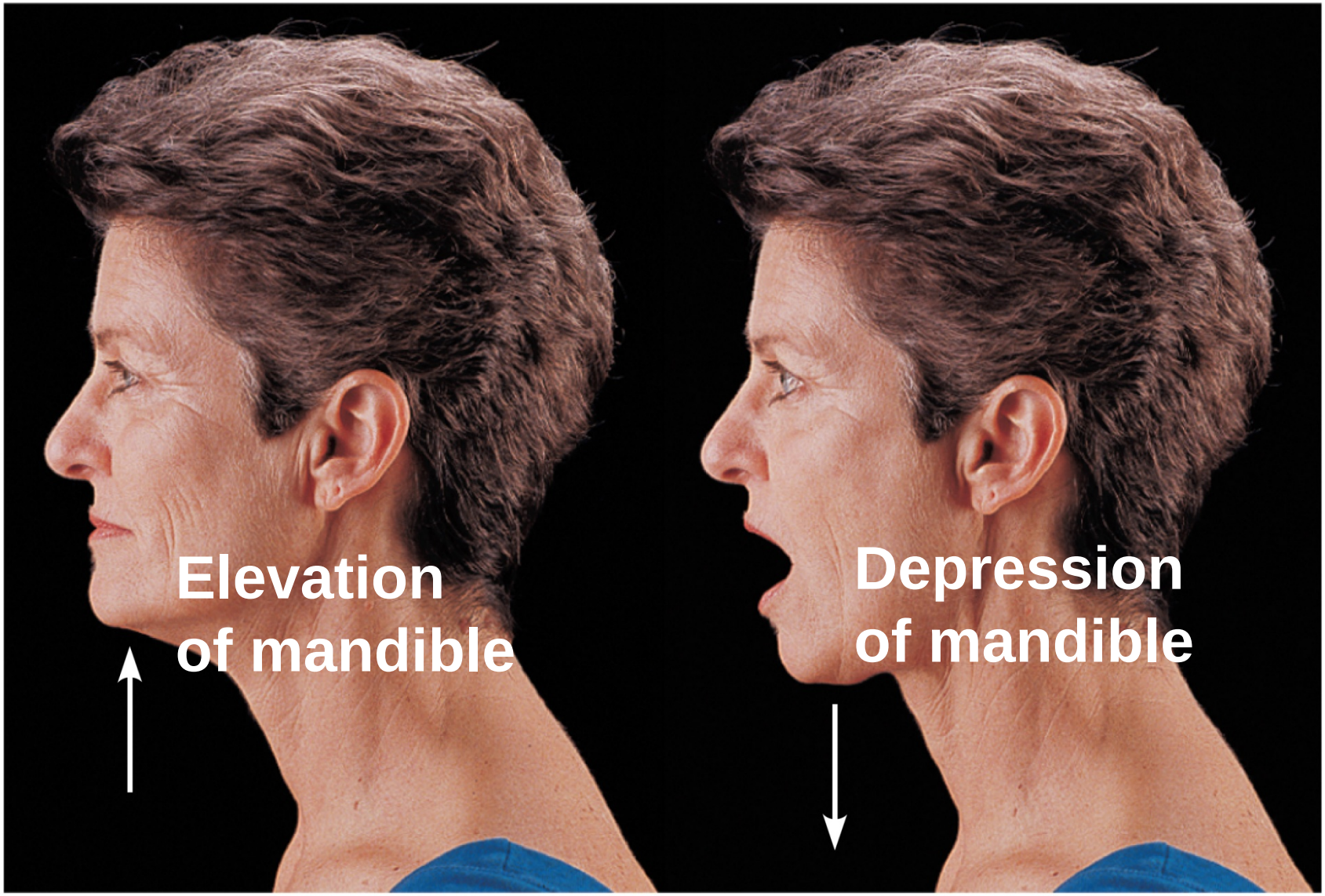
(b) Dorsiflexion and plantar flexion



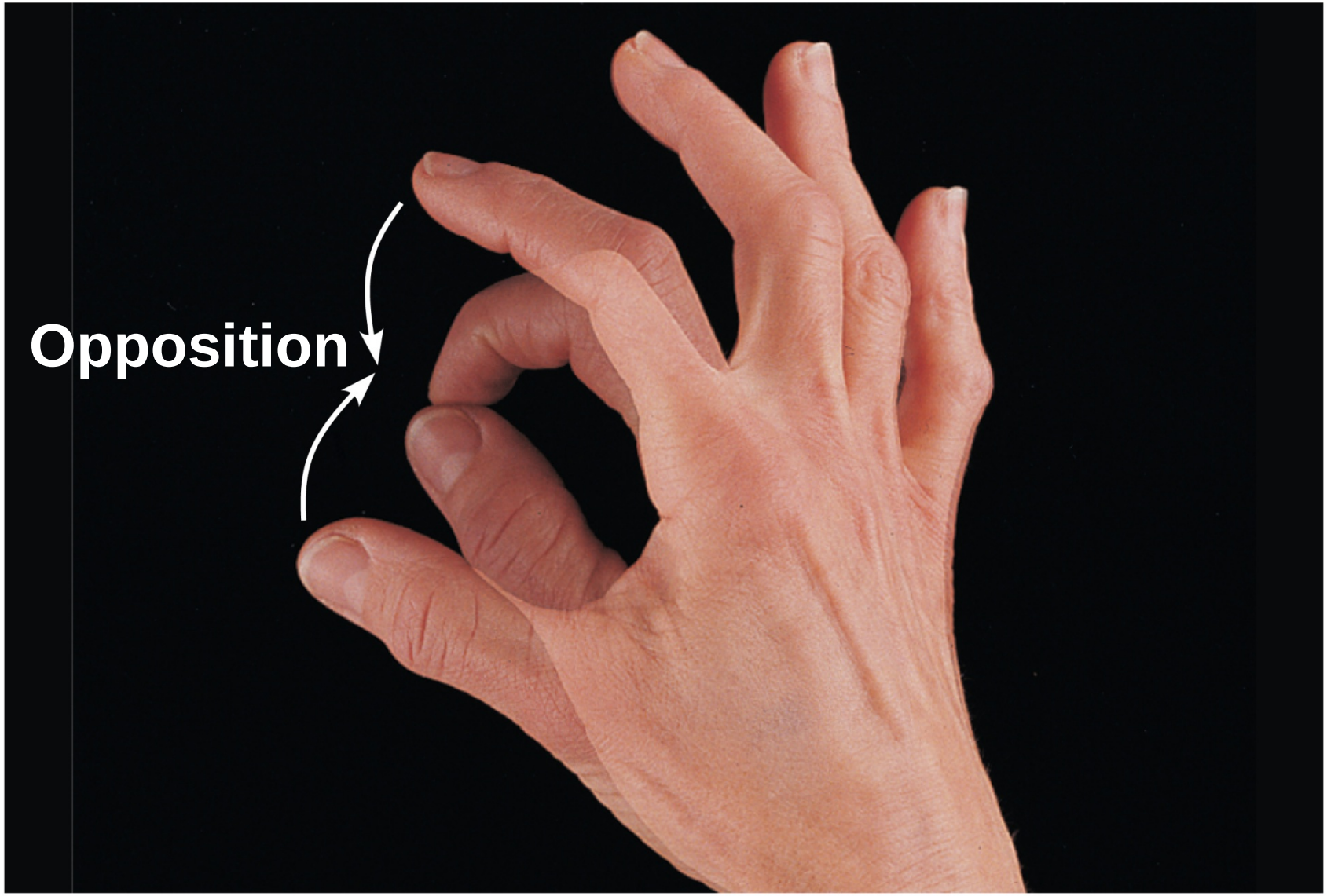
(c) Inversion and eversion



(d) Protraction and retraction



(e) Elevation and depression



(f) Opposition

Type of joint movement:

- Flexion- bent knee
- Extension- extend knee
- Hyperextension- bring leg back
- Dorsi flexion- heal
- Plantar flexion- toe
- Abduction- leg out
- Adduction-leg in
- Rotation- twisting
- Circumduction- circular motion
- Supination- palm up
- Pronation- palm down
- Eversion- foot out
- Inversion- foot in
- Protraction- chin forward
- Retraction- chin back
- Elevation- shoulders up
- Depression- shoulders down

Factors Influencing Joint Stability

A)The shape of articular surfaces.

B) Ligaments

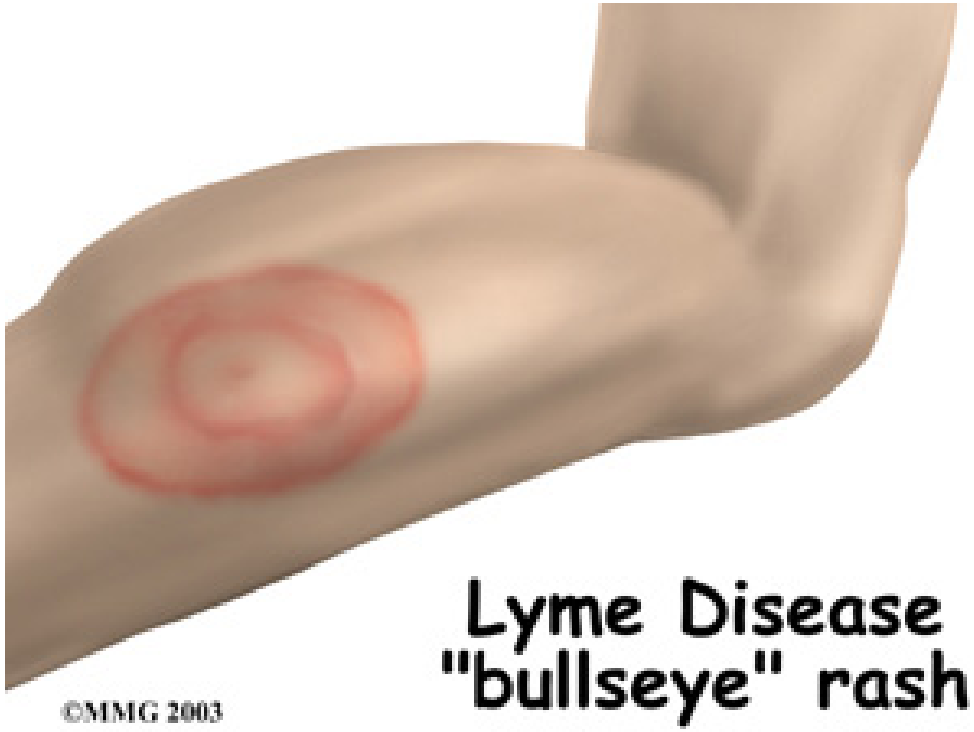
C) Muscle Tone

Disorders and Imbalances

- Bursitis
- Tendonitis
- Lyme disease
- Ankle sprains and fractures
- Osteoarthritis
- Gouty Arthritis
- Rheumatoid Arthritis

Disorders and Imbalances

- Lyme disease

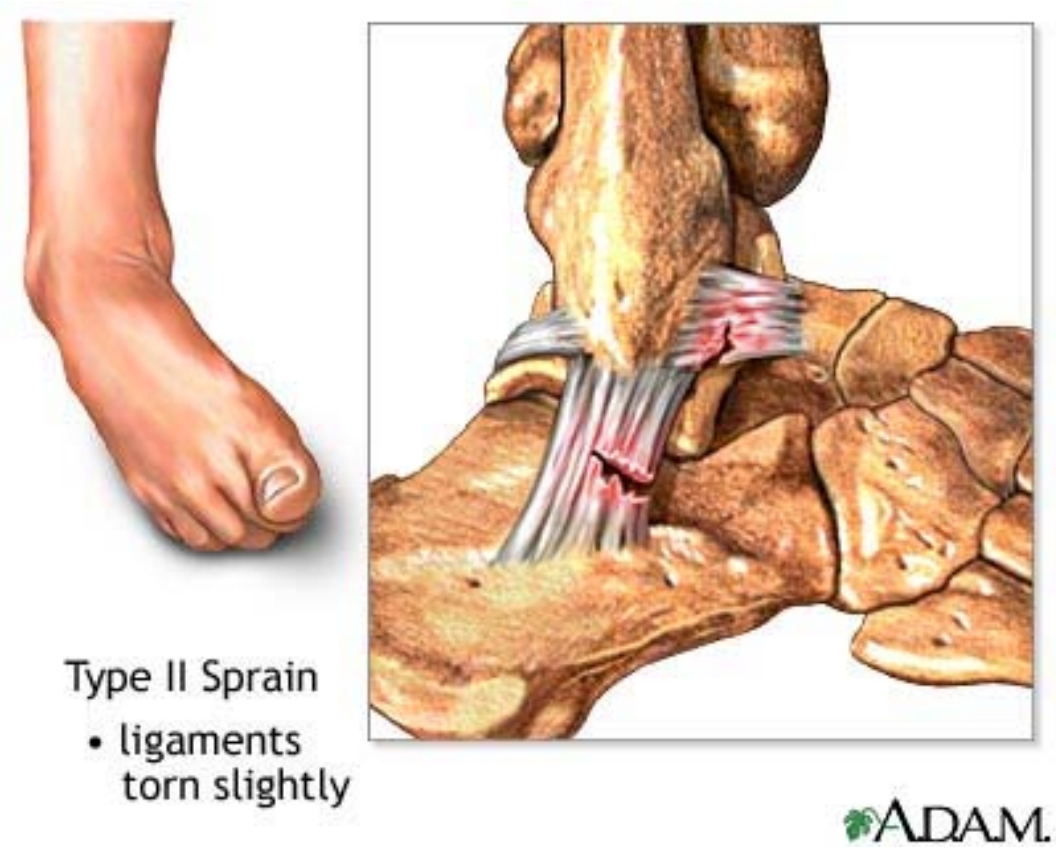


Disorders and Imbalances

- Ankle Sprain Type 1

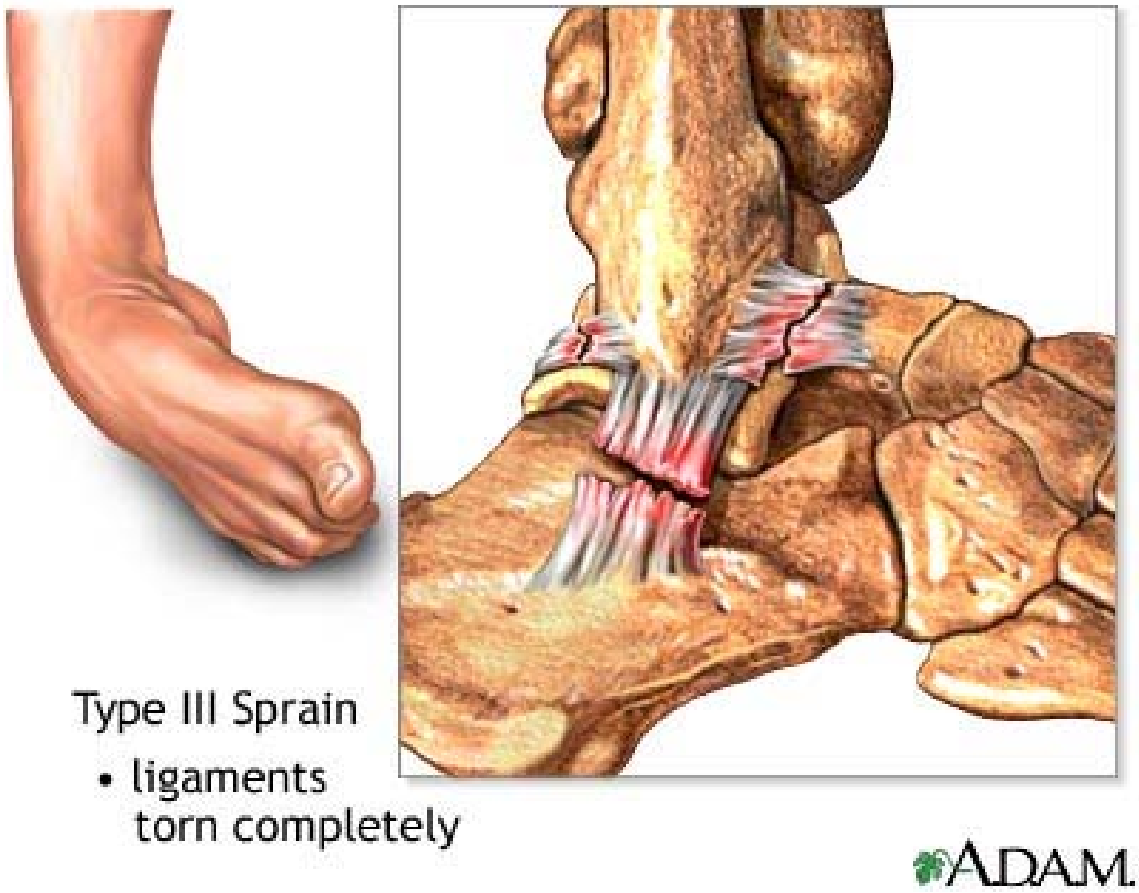
Disorders and Imbalances

- Ankle Sprain Type 2



Disorders and Imbalances

- Ankle Sprain Type 3



Osteoarthritis

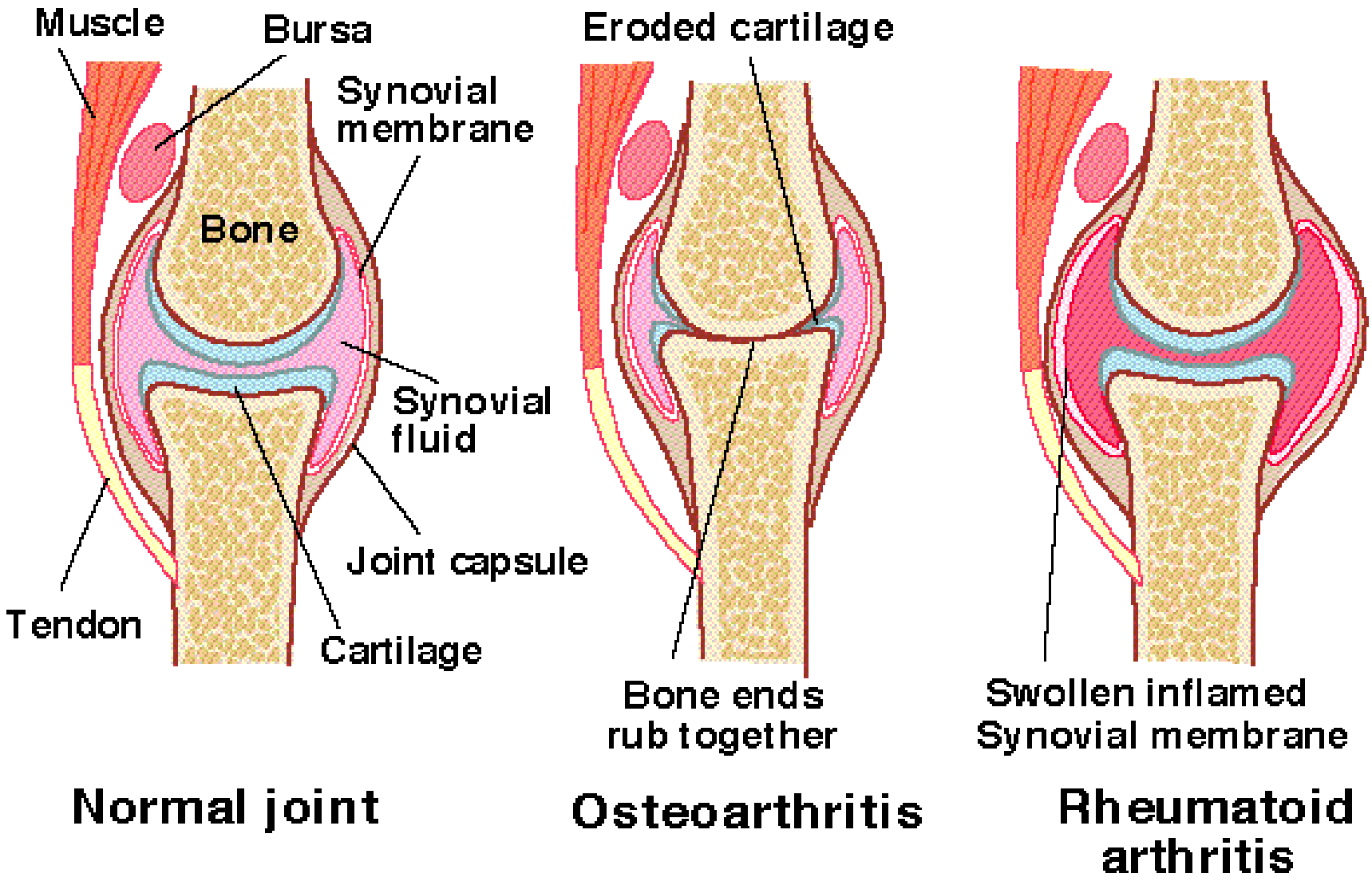
- Degenerative joint disease
  - aging, wear & tear
- Non inflammatory
  - Only cartilage is affected, not synovial membrane
- Deterioration of cartilage produces bone spurs
  - Restricts movement
- Pain upon awakening—disappears with movement

Gouty Arthritis

- **Uric crystals build up in joints—pain**
  - waste products of DNA & RNA metabolism
  - builds up in blood
  - deposited in cartilage causing inflammation and swelling
- Bones fuse
- Middle-aged men with abnormal gene

Rheumatoid Arthritis

- Autoimmune disorder
- Cartilage attacked
- Inflammation, swelling & pain
- Final step is fusion in joint

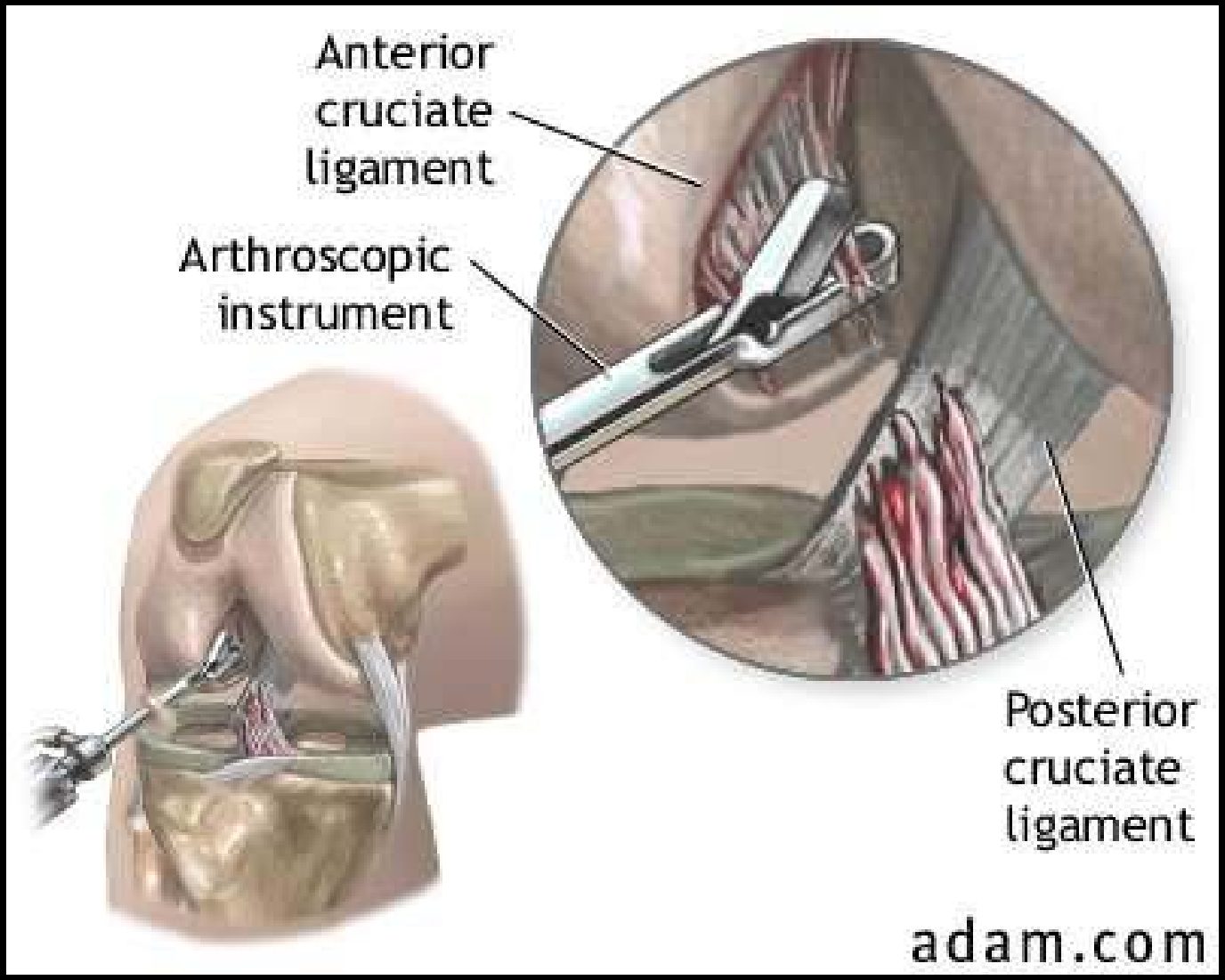

Muscle
Bursa
Synovial membrane
Bone
Synovial fluid
Joint capsule
Tendon
Cartilage
Eroded cartilage
Bone ends rub together
Swollen inflamed Synovial membrane
Normal joint
Osteoarthritis
Rheumatoid arthritis

Arthroscopy & Arthroplasty

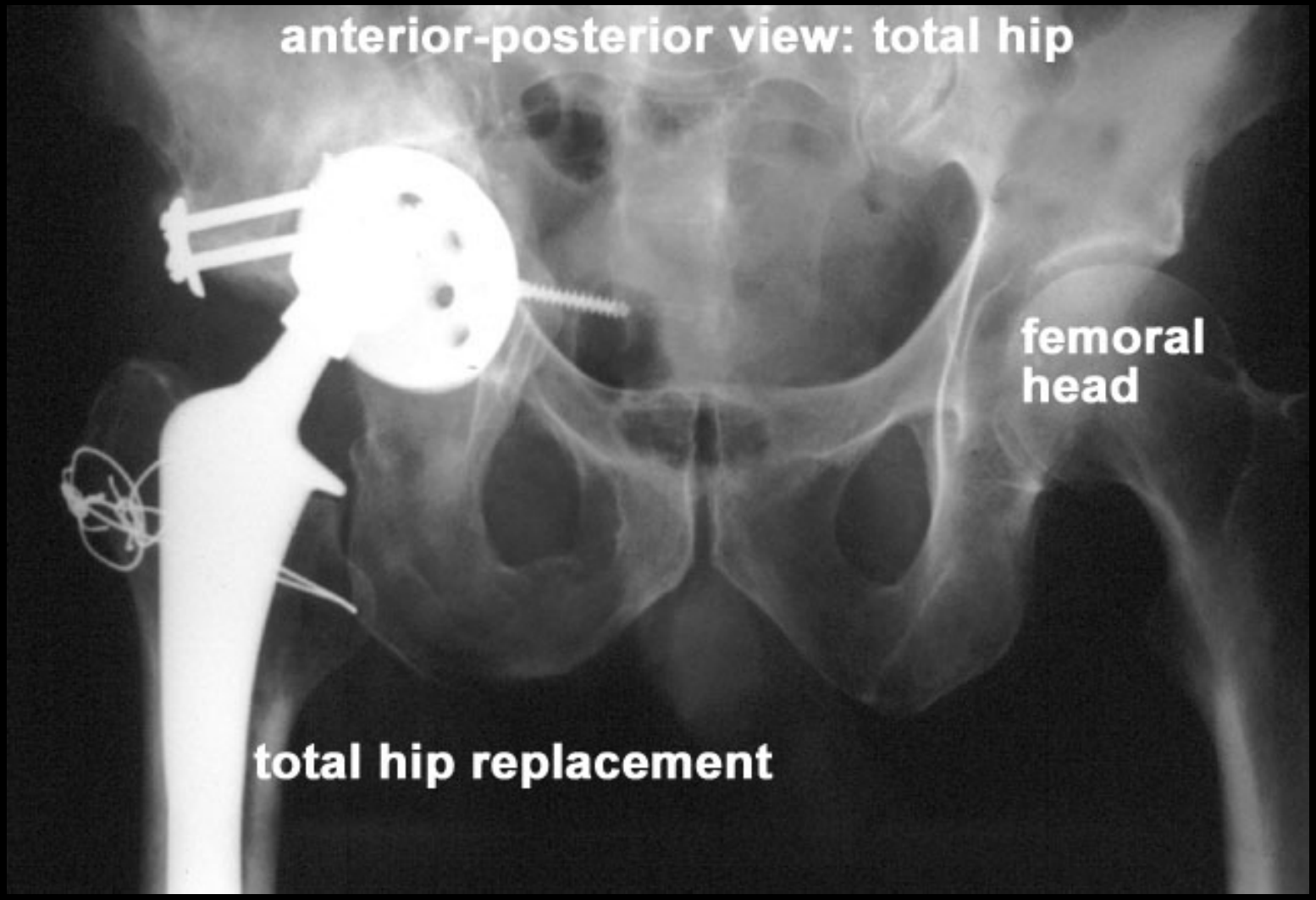
- Arthroscopy- examination of joint
  - instrument size of pencil
  - remove torn knee cartilage
  - small incisions only

- Arthroplasty- replacement of joints
  - total hip replaces acetablum & head of femur
  - plastic socket & metal head
  - knee replacement common

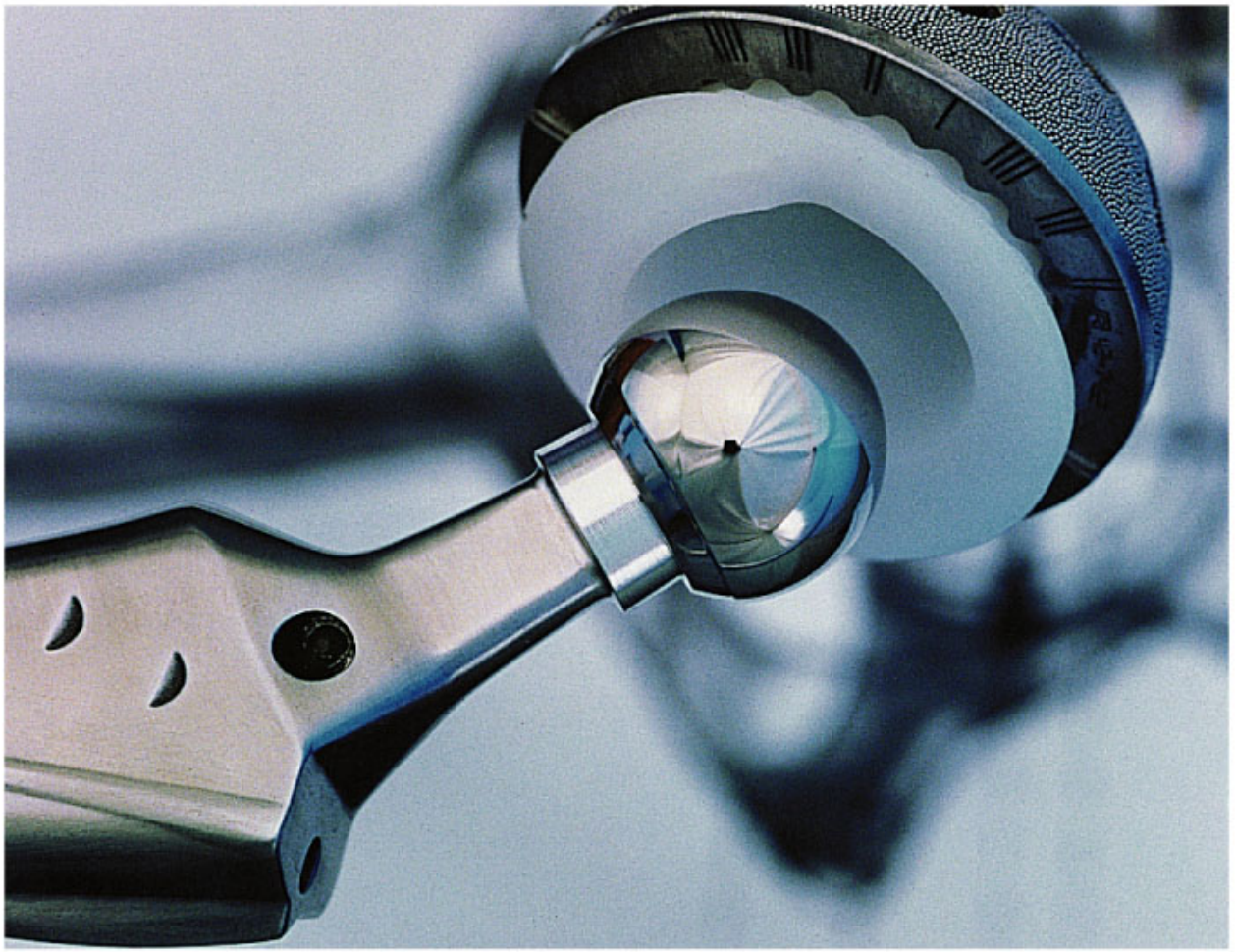
Arthroscopy
Examination of Joint



Arthroplasty
Hip Replacement



Hip Prosthesis



Photograph of a hip prosthesis.

X ray of right knee showing total knee replacement prosthesis (co-designed by Kenneth Gustke, M.D., of Florida Orthopedic Institute).

INQUIRY

1. What is a meniscus?
2. Demonstrate adduction.
3. What does the acronym RICE stand for?
4. What type of joint is a synovial joint?
5. Where is a planar joint found?
6. Why is it a good idea to warm up before running?
7. What is gout?
8. What causes lyme disease?