

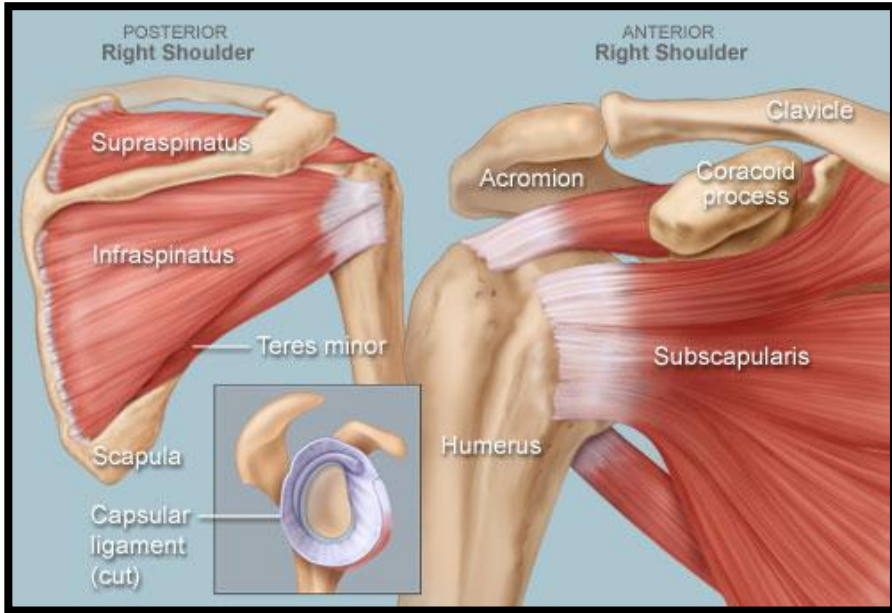
# American Society of Orthopedic Professionals

## Orthopedic Lecture Series<sup>©</sup>

*Bone/ Structures, Fracture Types and Skeletal Disorders/ Specialty Casts  
and Appliances/Surgical Procedures, Positioning and Devices*

### **Lesson 6: Soft Tissue**

# Soft Tissue - Shoulder



<http://www.webmd.com/pain-management/picture-of-the-shoulder>

The ***rotator cuff*** consists of 4 muscles that stabilize the shoulder joint and permit motion of various kinds.

The muscles that abduct and rotate the humerus in the glenoid (on the shoulder blade) are:

- ▶ Infraspinatus
- ▶ Subscapularis
- ▶ Supraspinatus
- ▶ Teres minor

## Infraspinatus

- ▶ Large muscle that stabilizes the shoulder; part of the rotator cuff.
- ▶ Responsible for externally rotating the humerus (upper arm bone) at the shoulder.
- ▶ Attaches to back of the scapula (shoulder blade) and spine of the scapula.

## Subscapularis

- ▶ Large muscle covering the front surface of the scapula (shoulder blade) that internally rotates the humerus (upper arm bone).
- ▶ Attaches to the proximal humerus.

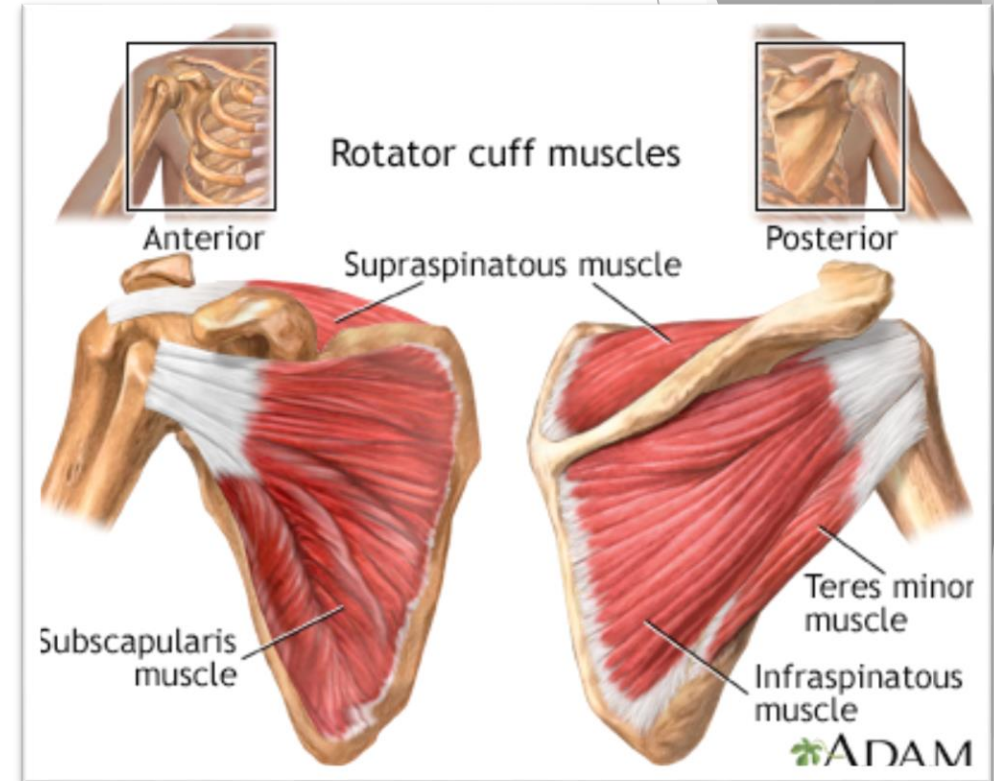
# Soft Tissue - Shoulder

## Supraspinatus

- ▶ Shoulder muscle that abducts (raises) the humerus (upper arm bone).
- ▶ Originates from the scapula (shoulder blade) above the spine of the scapula and attaches to the superior facet of the greater tuberosity of the humerus.

## Teres minor

- ▶ Muscle that draws the humerus (upper arm bone) toward the glenoid fossa (maintains humerus against its cup in the shoulder)
- ▶ Externally rotates
- ▶ Originates from the inferior lateral border of the scapula (shoulder blade) and attaches to the proximal humerus



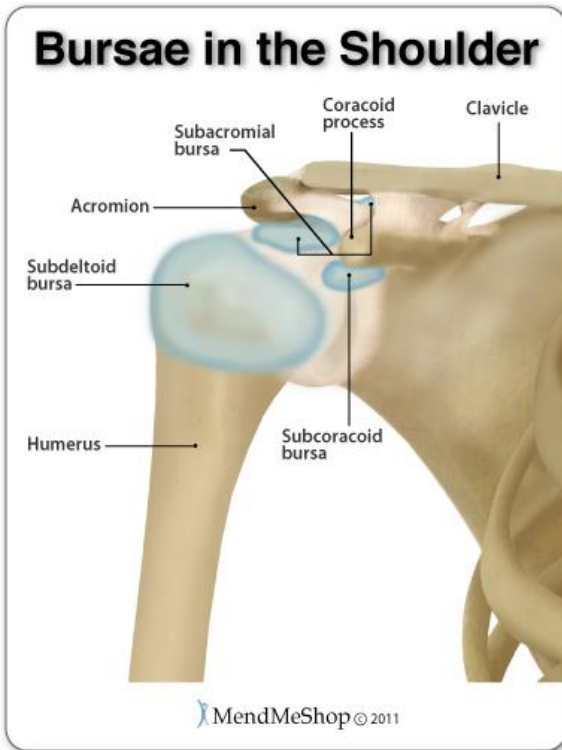
# Soft Tissue - Shoulder

The **acromion** of the scapula is the site of origin for the **deltoid**.

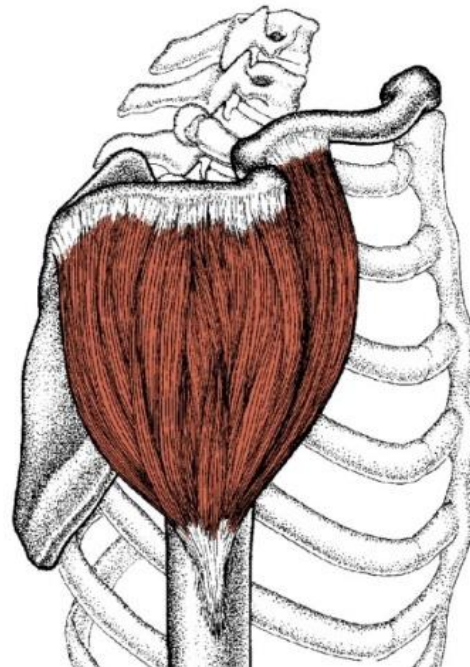
- ▶ The deltoid inserts on the deltoid tuberosity of the humeral shaft

Tears to the muscles of the rotator cuff, dislocation, and ligament damage are common shoulder injuries.

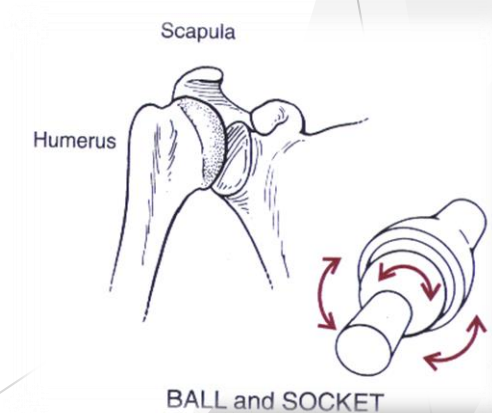
The **bursae** of the shoulder are found between the muscles of the rotator cuff and the outer muscles.



<http://www.mendmeshop.com/bursa/shoulder-bursitis.php>

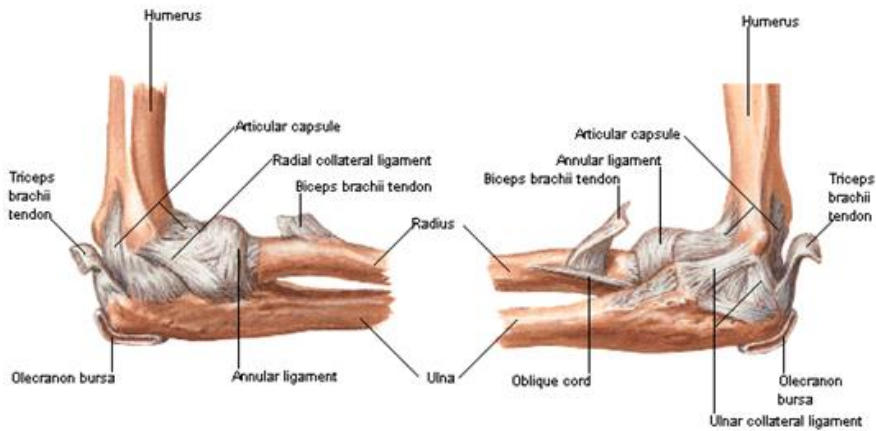


<http://www.gustrength.com/muscles:deltoid-location-actions-and-trigger-points>

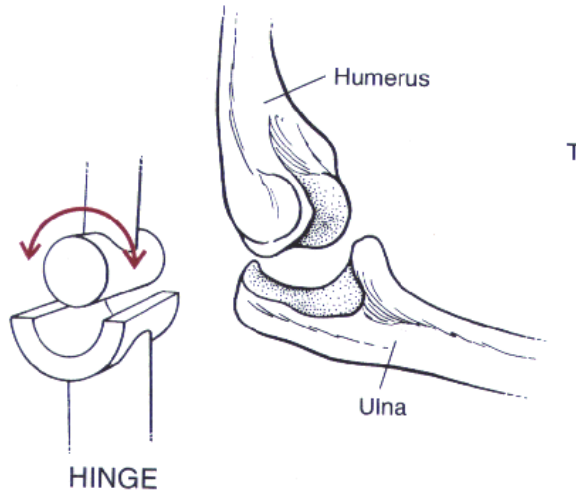


<http://ovrt.nist.gov/projects/vrml/h-anim/joint1C.gif>

# Soft Tissue - Elbow



<http://www.kendo.org.uk/articles/common-injuries-4-elbow-hyperextension/>



<http://ovrt.nist.gov/projects/vrml/h-anim/joint1A.gif>

- ▶ The humerus, radius, and ulna form this hinge joint.
- ▶ The elbow is a very stable joint.
- ▶ The joint is supported by the ulnar collateral ligament, the radial collateral ligament, the anterior ligament, and the posterior ligament.

## Ulnar Collateral Ligament

- ▶ Connective tissue band running along the inner side of the elbow connecting the humerus (arm bone) and the ulna (upper forearm bone)
- ▶ Acts as a restraining ligament of the elbow
  - ▶ Keeping the ulna from rotating out

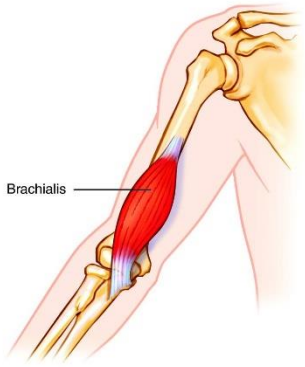
## Radial Collateral Ligament

- ▶ Connective tissue band running along the outer side of the elbow connecting the humerus and the ulna
- ▶ Acts a restraining ligament of the elbow
  - ▶ Keeping the ulna from rotating inward

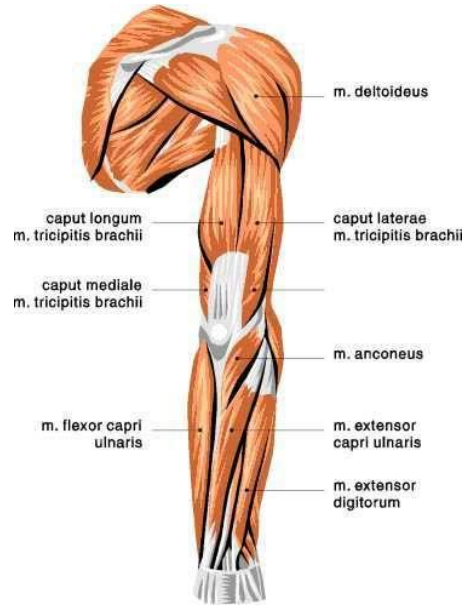
## Annular Ligament



# Soft Tissue - Elbow



<http://medical-dictionary.thefreedictionary.com/brachialis>



<https://www.pinterest.com/pin/372884044121273719/>

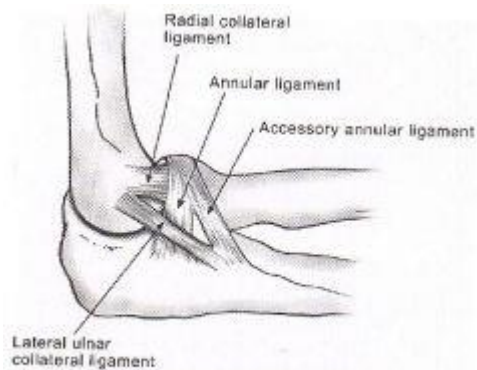


Figure 11-8. Diagram of the lateral side of elbow showing components of the radial collateral ligament complex.

The annular ligament keeps the radius in contact with the ulna at the radial notch.

- ▶ One of many connective tissue bands that surround the wrist, elbow or ankle joint, or the flexor tendons of the fingers
- ▶ At the elbow joint, the ring-shaped cartilage that surrounds the radial head (bone on thumb side of forearm), helping to keep it from dislocation

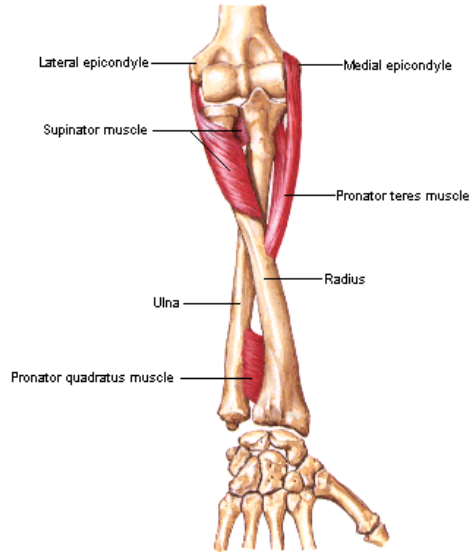
The muscle in front of the joint is the Brachialis.

- ▶ Muscle on front of arm, beneath the biceps
- ▶ Connects the humerus and ulna
- ▶ Flexes the forearm (bends the elbow)

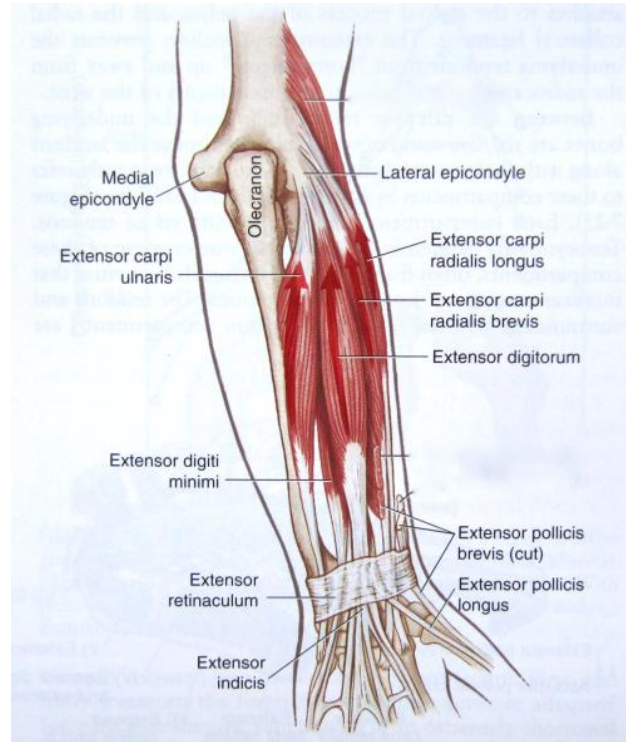
## Triceps brachii

- ▶ The muscles behind the joint are the Triceps brachii, and the Anconeus.
- ▶ Large extensor muscle on the back of the upper arm that extends the forearm at the elbow joint
- ▶ Originates from the glenoid on the scapula (shoulder blade)
- ▶ The upper part of the humerus (upper arm bone), and mid-portion of the humerus
- ▶ Attaches to the back of the elbow at the olecranon

# Soft Tissue - Elbow



<http://www.knowyourbody.net/wp-content/uploads/2013/10/Supinator-muscle-Image.gif>



<https://ittcs.wordpress.com/2010/11/20/notes-on-anatomy-and-physiology-one-big-tendon/>

The muscles laterally are the Supinator, and the common tendon of origin the Extensor muscles.

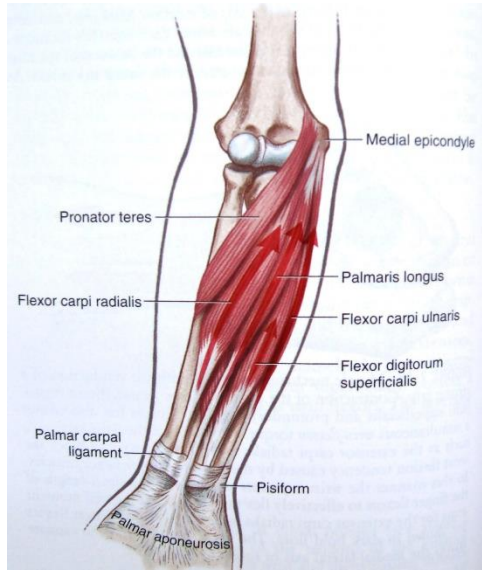
## Supinator

- ▶ Muscle that turns the palm upward
- ▶ Attached to the two forearm bones (radius and ulna)
- ▶ Originates from the lateral epicondyle of the humerus and upper portion of the ulna
- ▶ Attaches to the mid-portion of the radius

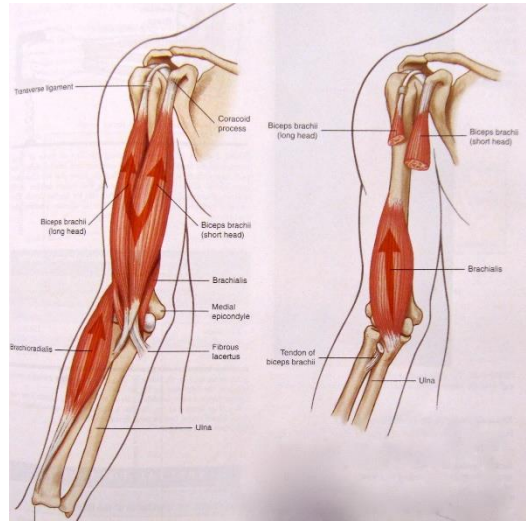
## Extensor

- ▶ Muscle that causes a joint to straighten

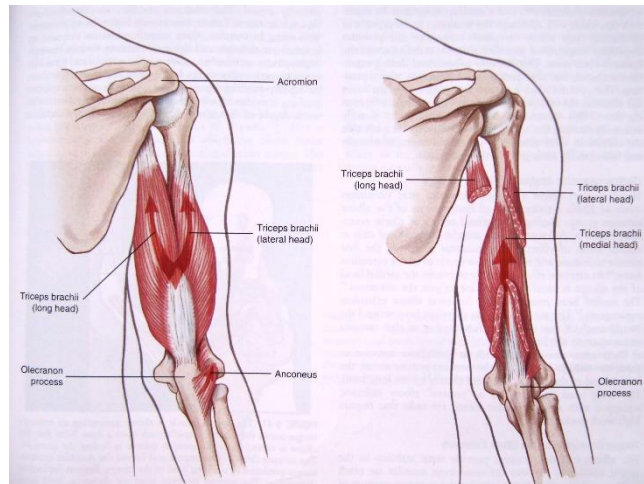
# Soft Tissue - Elbow



[https://ittcs.files.wordpress.com/2010/11/img\\_03131.jpg](https://ittcs.files.wordpress.com/2010/11/img_03131.jpg)



[https://ittcs.files.wordpress.com/2010/11/img\\_0346.jpg/](https://ittcs.files.wordpress.com/2010/11/img_0346.jpg/)



The medial muscles are the Flexor carpi ulnaris, and the common tendon of origin of the Flexor muscles.

## Flexor carpi ulnaris (FCU)

- ▶ In the forearm
- ▶ Attaches to the wrist
- ▶ Bends the wrist down and toward the little finger

## Flexor

- ▶ Muscle that causes attached part to bend

Simply, the **biceps** flexes the joint, and the **triceps** extends the joint.

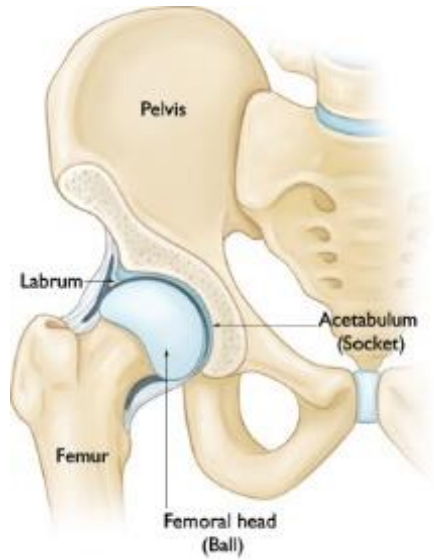
The elbow joint can flex, extend, pronate, and supinate.

- ▶ The articular surfaces of the elbow joint share a synovial membrane which endorses the joint.

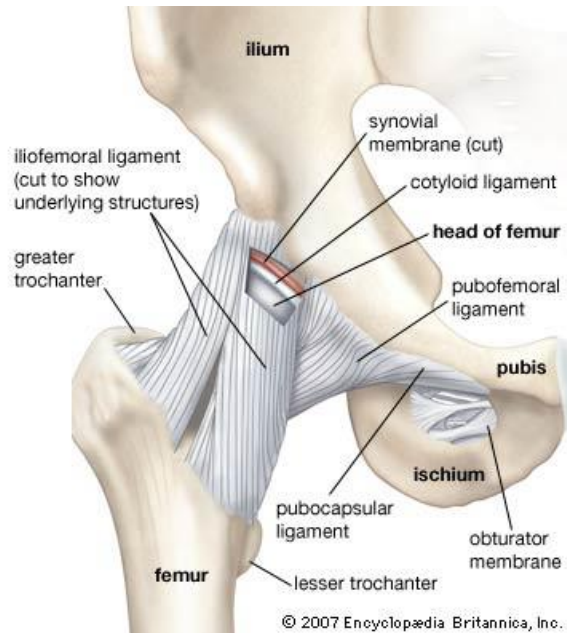
[https://ittcs.files.wordpress.com/2010/11/img\\_0344.jpg](https://ittcs.files.wordpress.com/2010/11/img_0344.jpg)



# Soft Tissue - Hip



<http://orthoinfo.aaos.org/topic.cfm?topic=A00571>



<http://sszoneukzn.blogspot.com/2011/05/football-shoot-from-hip.html>

The hip is a ball-and-socket joint, and is the most mobile of the joints in lower extremity.

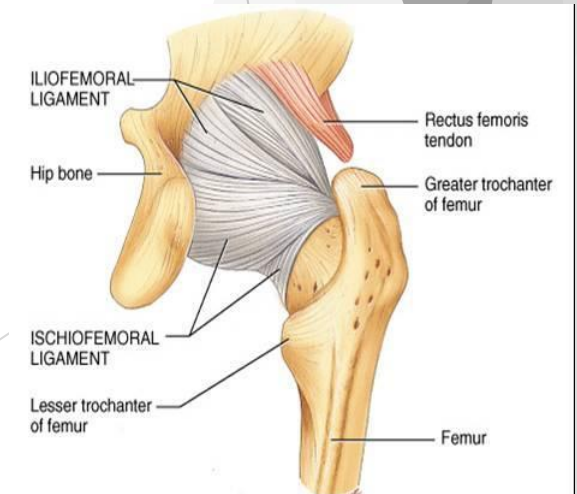
The joint is formed by the articulation of the **acetabulum** of the **pelvis** with the head of the **femur**.

The acetabulum is surrounded by a fibro-cartilaginous cuff which makes the cup of the acetabulum deeper.

▶ This makes it harder to dislocate

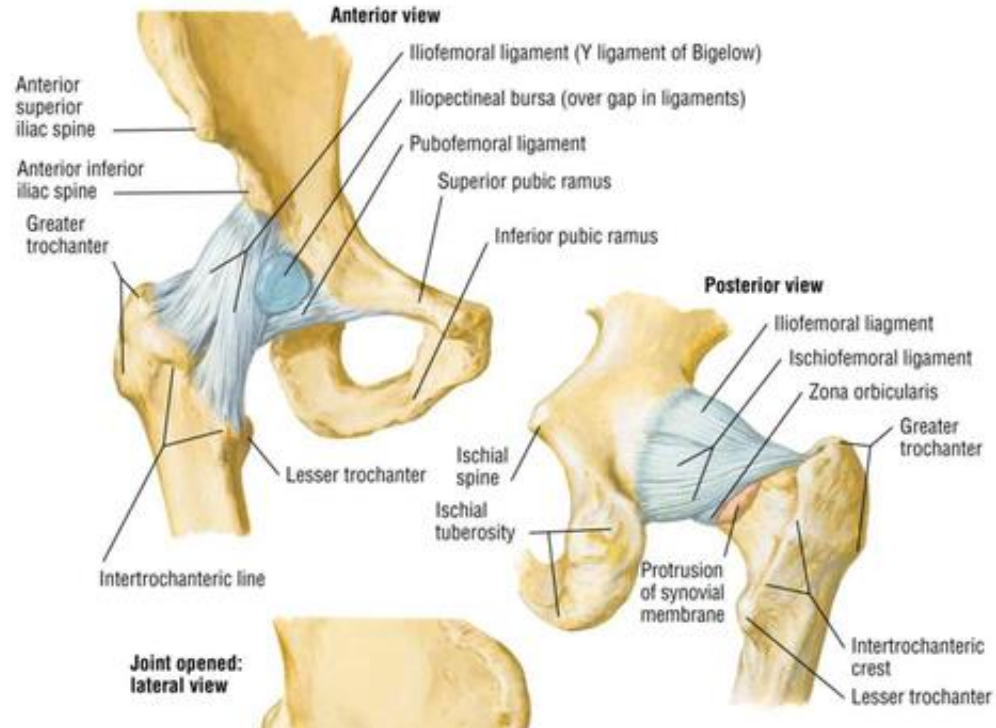
The hip joint is tied together by 3 ligaments

- ▶ Iliofemoral ligament
- ▶ Pubofemoral ligament
- ▶ Ischiofemoral ligament



<https://www.studyblue.com/notes/n/ap-ch10-articulations/deck/3170350>

# Soft Tissue - Hip



<http://healthfavo.com/iliofemoral-ligament-pain.html>

## Iliofemoral ligament

- ▶ Joins the pelvis and femur
- ▶ This ligament prevents the joint from extending excessively

## Pubofemoral ligament

- ▶ Passes from the pubis to the femur

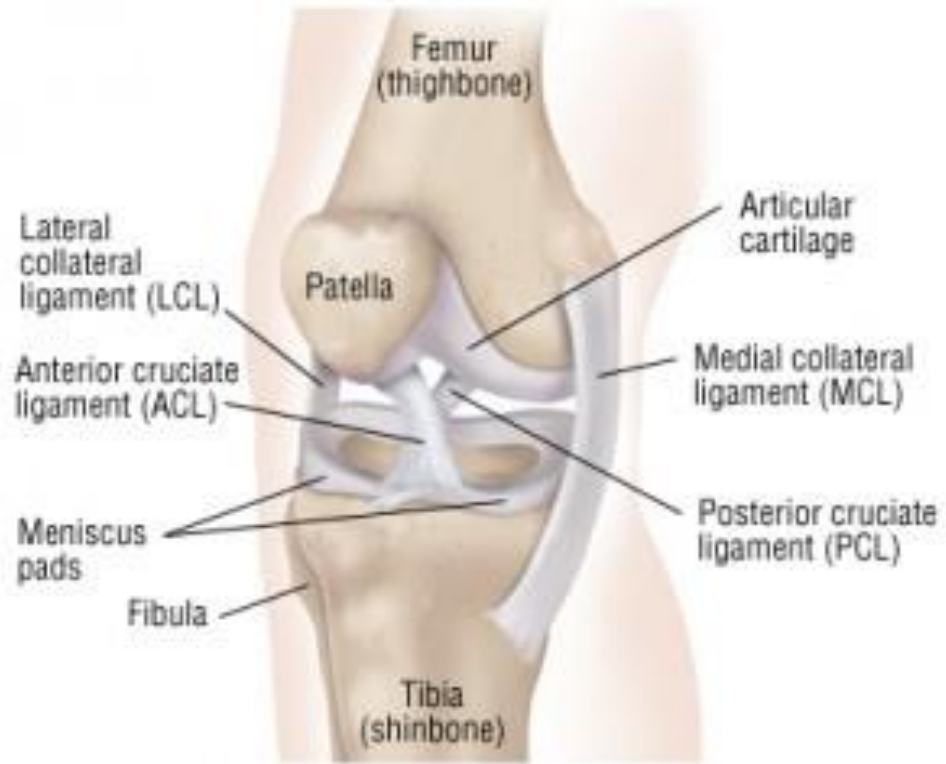
## Ischiofemoral ligament

- ▶ Stretches from the acetabular rim to the femur

The muscles of the hips allow extension, medial and lateral rotation, adduction, flexion, abduction.

The hip is enclosed by an extensive fibrous capsule.

# Soft Tissue - Knee



<http://www.askdoctork.com/i-injured-my-pcl-playing-football-how-long-will-my-recovery-take-201310195544>

The patella is located within the quadriceps tendon.

- ▶ The **patella tendon** originates above the knee joint and inserts below it, crossing over the patella.

The **anterior and posterior cruciate ligaments** help stabilize the knee joint.

- ▶ They are located in the middle of the joint in the intercondylar area.

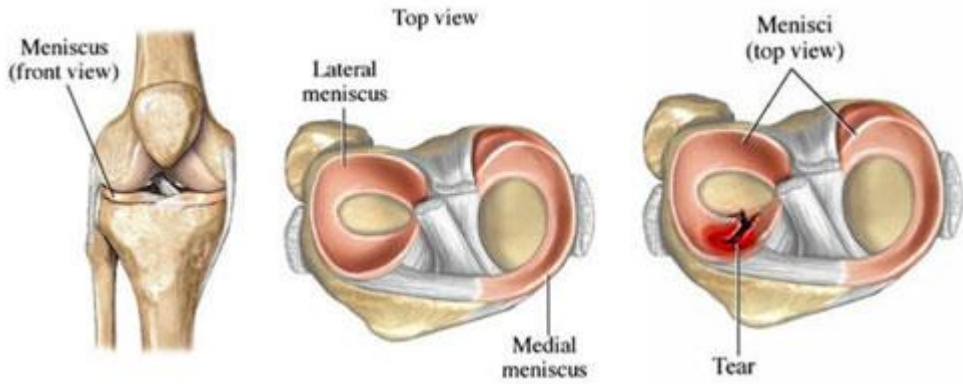
## Posterior Cruciate Ligament (PCL)

- ▶ The posterior cruciate ligament, known as the PCL, prevents the anterior displacement of the femur relative to the tibia.
- ▶ It attaches to the medial condyle of the femur, and the posterior surface of the tibia at the midline.

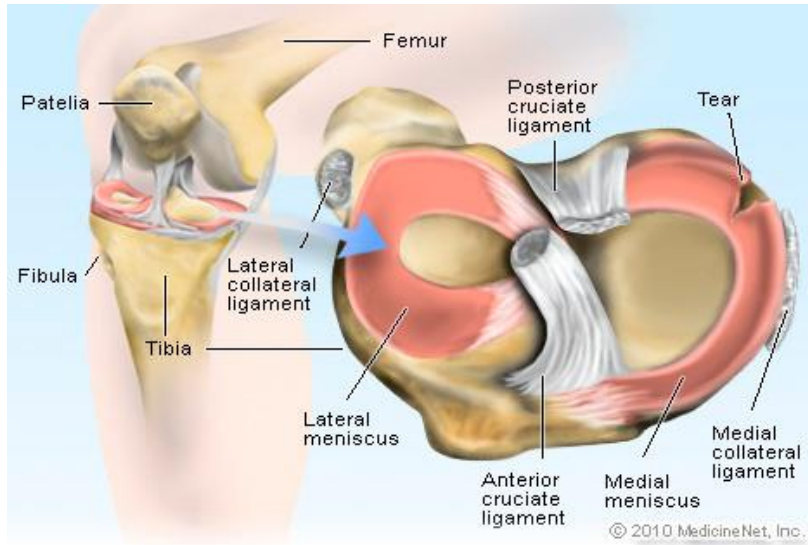
## Anterior Cruciate Ligament (ACL)

- ▶ The anterior cruciate ligament, known as the ACL, prevents the posterior displacement of the femur relative to the tibia.
- ▶ It prevents the knee from hyperextending, and limits the extent that the femur can rotate medially when the foot is planted.
- ▶ It attaches to the posterior lateral condyle of the femur, and to a notch between the tibial condyles.
- ▶ The tibia is topped by the menisci.

# Soft Tissue - Knee



<http://www.jointsurgery.in/knee-arthoscopy/meniscal-tears/>



[http://theorthopedicpa.com/?p=206&option=com\\_wordpress&Itemid=55](http://theorthopedicpa.com/?p=206&option=com_wordpress&Itemid=55)

## Menisci

Each knee has 2 menisci.

- ▶ The lateral and medial menisci act as shock absorbers for the knee.
- ▶ These structures are fluid-filled crescent-shaped disks of cartilage which sit on the upper surface of the tibia.

The borders of the menisci are attached to the lining of the knee.

Clinically, the meniscus is divided into three sections

- ▶ Anterior horn
- ▶ Body
- ▶ Posterior horn

Except at its borders, the menisci are avascular, meaning they have no blood supply.

Because of this, small tears at the edge of the menisci may heal, but the inner part of the menisci cannot repair itself if damaged.

## Meniscal Tears

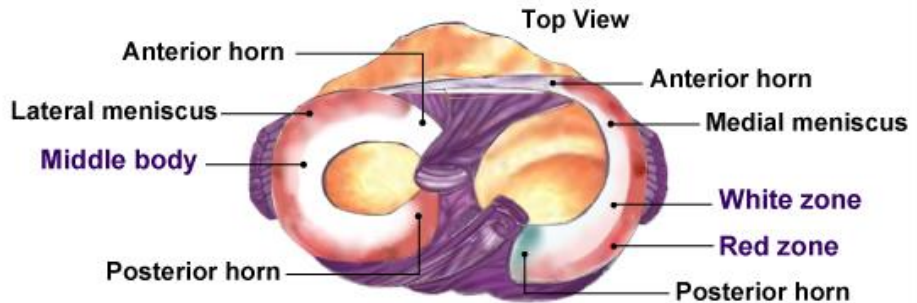
- ▶ Meniscal tears usually occur as a result of twisting injuries, or a direct hit to the side of the knee.
- ▶ The menisci dry out with normal aging, and tears may result.
- ▶ The medial meniscus tears more often than the lateral meniscus.



# Soft Tissue - Knee



## Menisci Blood Supply Zones



Meniscus tears in the Red Zone (most blood supply) heal faster than tears in the White Zone (lowest blood supply).

MendMeShop © 2010

<http://www.mendmyknee.com/meniscus-injuries/diagnosing-meniscus-injuries.php>

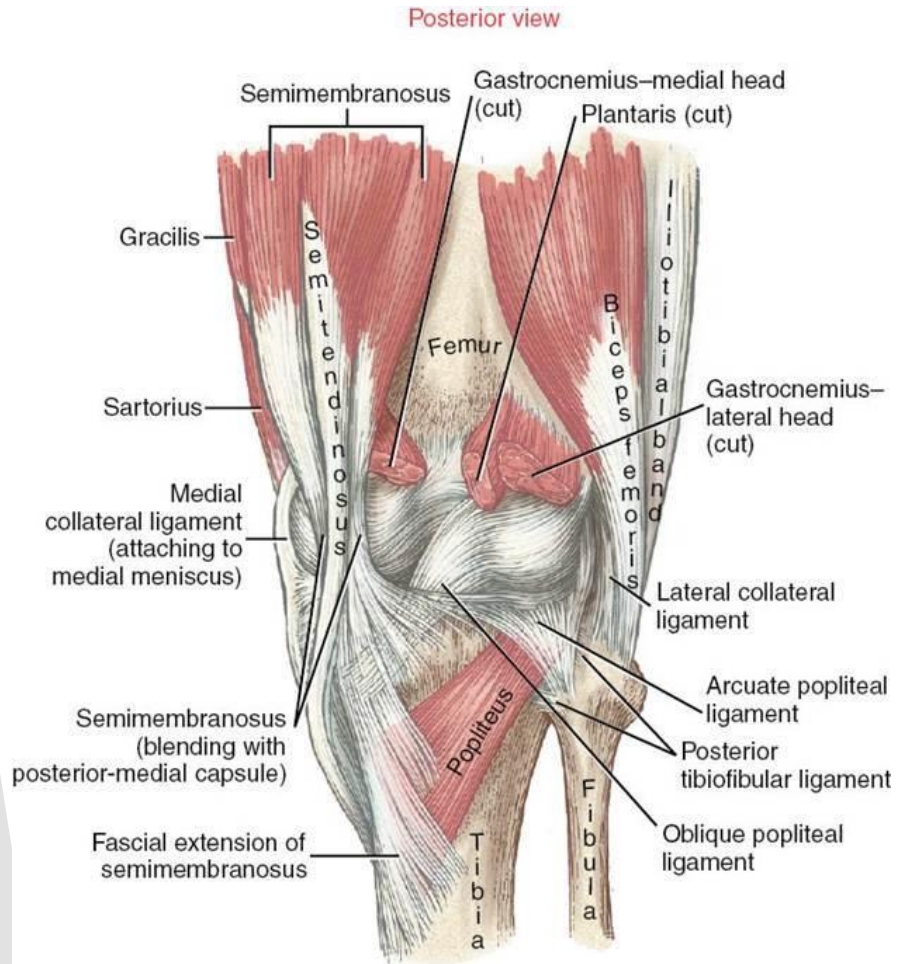
## Medial Meniscus

- ▶ Almost semi-circular in shape
- ▶ The anterior end of the medial meniscus, which is thin and pointed, is attached to the anterior intercondyloid fossa of the tibia
- ▶ The posterior end of the meniscus is attached to the posterior intercondyloid fossa of the tibia
- ▶ Due to its attachments, the medial meniscus cannot slide around very much, and tears under stress

## Lateral Meniscus

- ▶ Almost circular
- ▶ Covers more of the articular surface of the tibia than does the medial meniscus
- ▶ Lateral side of the meniscus has a groove to accommodate the tendon of the Popliteus
- ▶ Anterior portion attaches in front of the tibia's intercondyloid eminence
- ▶ The posterior end attaches behind the tibia's intercondyloid eminence, and in front of the posterior part of the medial meniscus
- ▶ One part of the lateral meniscus is not attached
- ▶ Under stress, it is more likely to move than tear

# Soft Tissue - Knee



## Knee Capsule

The capsule of the knee is attached to the femur, tibia, and fibula at several locations.

- ▶ Proximally, it is attached to the femur at the lateral and medial condyles
- ▶ Distally, it is attached to the tibia at the lateral and medial condyles
- ▶ It is also attached to the superior part of the fibula

The capsule is stabilized by the patellar and quadriceps tendons, the medial and lateral collateral ligaments, and the **popliteus** and **gastrocnemius** muscles.

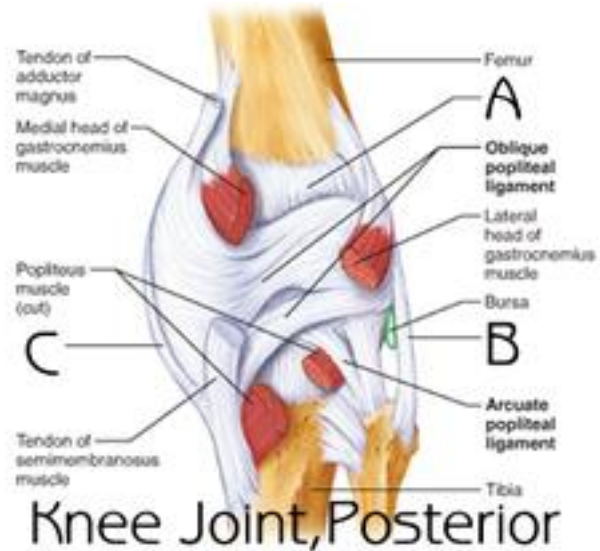
## Popliteus

- ▶ Small oblique muscle that rotates the tibia (shinbone) medially on the femur (thighbone)
- ▶ Extends from lateral posterior side of the distal femur across the knee joint, inserting medially on the proximal tibia

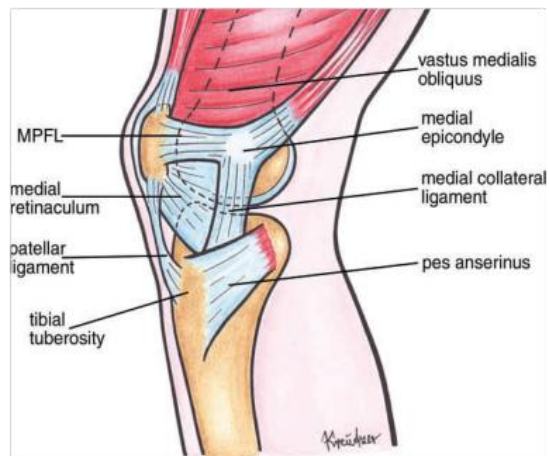
## Gastrocnemius

- ▶ Large muscle on the back of the leg that bends the knee and ankle
- ▶ Attaches proximally to the distal end of the femur (thighbone) and distally to the heel

# Soft Tissue - Knee



<http://quizlet.com/12646959/skeletal-system-anatomy-2304-flash-cards/>



The capsule has several thickened areas which form internal ligaments.

These internal ligaments are:

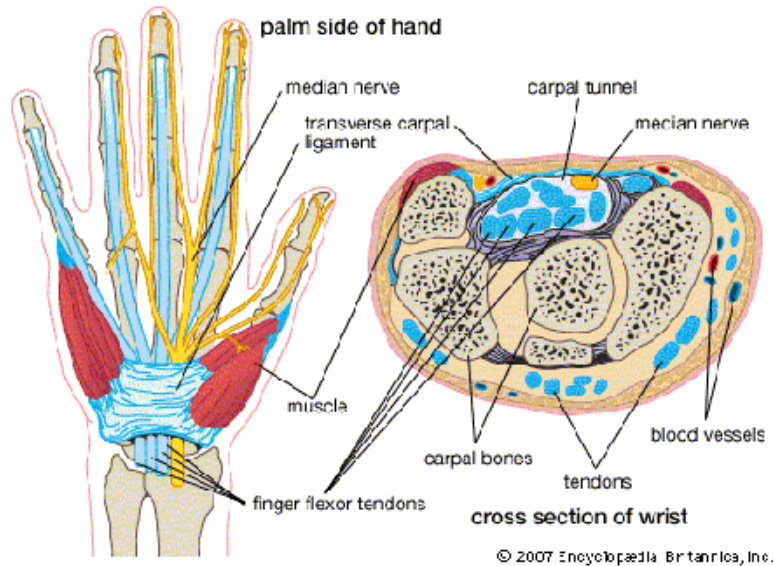
- ▶ Short internal ligament
- ▶ Arcuate popliteal ligament (short external ligament)
- ▶ Medial patellar retinacular fiber
- ▶ Lateral patellar retinacular fiber

The medial patellar reticular fibers prevent the patella from dislocating laterally.

- ▶ Anatomically, there is a deficiency of the capsule at the back of the knee.
  - ▶ Due to this, the synovium may herniate under pressure, and form a Baker's cyst.

[http://www.physio-pedia.com/Patellofemoral\\_Instability](http://www.physio-pedia.com/Patellofemoral_Instability)

# Soft Tissue – Carpal Tunnel



## Carpal Tunnel

- ▶ A narrow passageway in the wrist formed by the carpal bones
- ▶ The transverse carpal ligament on the inside of the wrist
- ▶ The circumference of the tunnel is about the same as that of the thumb.
- ▶ The median nerve and 9 flexor tendons of the hand travel through this tunnel.
  - ▶ The carpal tunnel protects these structures
- ▶ The size of the tunnel can be decreased significantly through flexion of the wrist.

## **Carpal Tunnel Syndrome (CTS)**

- ▶ Caused by the compression of the median nerve in the tunnel
- ▶ Compression may result from swelling, or thickening of the transverse carpal ligament
- ▶ An acquired or congenital deformity can also cause such a compression



# Soft Tissue – Wrist

## Wrist Joint

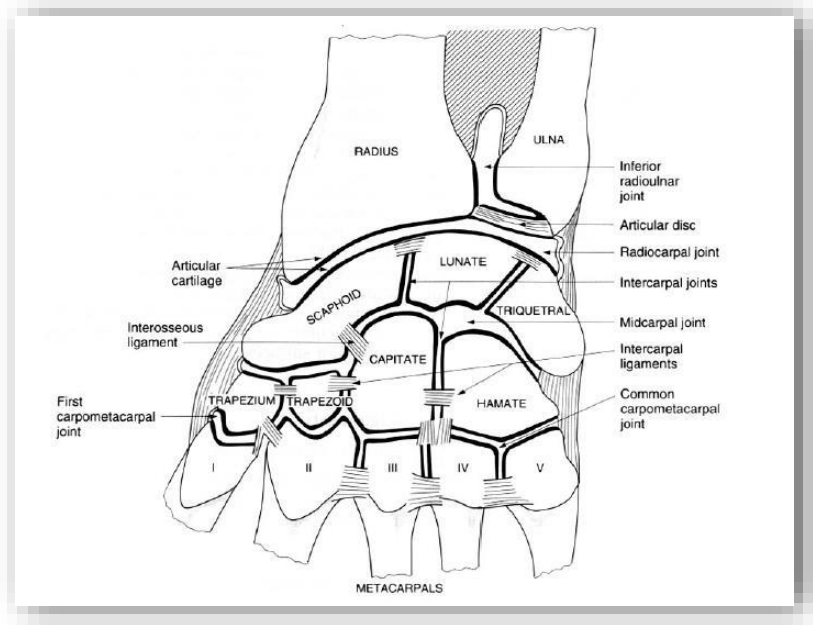
- ▶ Formed by the distal end of the radius, and the proximal carpal bones
- ▶ This is the radiocarpal joint
- ▶ The midcarpal joint, which is found between the proximal and distal row of carpal bones, is closely associated

The ligaments associated with the wrist include:

- ▶ Volar radiocarpal ligament
- ▶ Dorsal radiocarpal ligament
- ▶ Ulnar collateral ligament
- ▶ Radial collateral ligament

The synovial membrane of the joint extends from the distal end of the radius to the proximal ends of the articular surfaces of the carpal bones.

The synovial membrane has numerous folds in it, and is loose to allow movement



<http://completesoccertraining.blogspot.com/2013/01/the-midcarpal-joint-part-i.html>

[http://en.wikipedia.org/wiki/Midcarpal\\_joint#mediaviewer/File:Gray334.png](http://en.wikipedia.org/wiki/Midcarpal_joint#mediaviewer/File:Gray334.png)

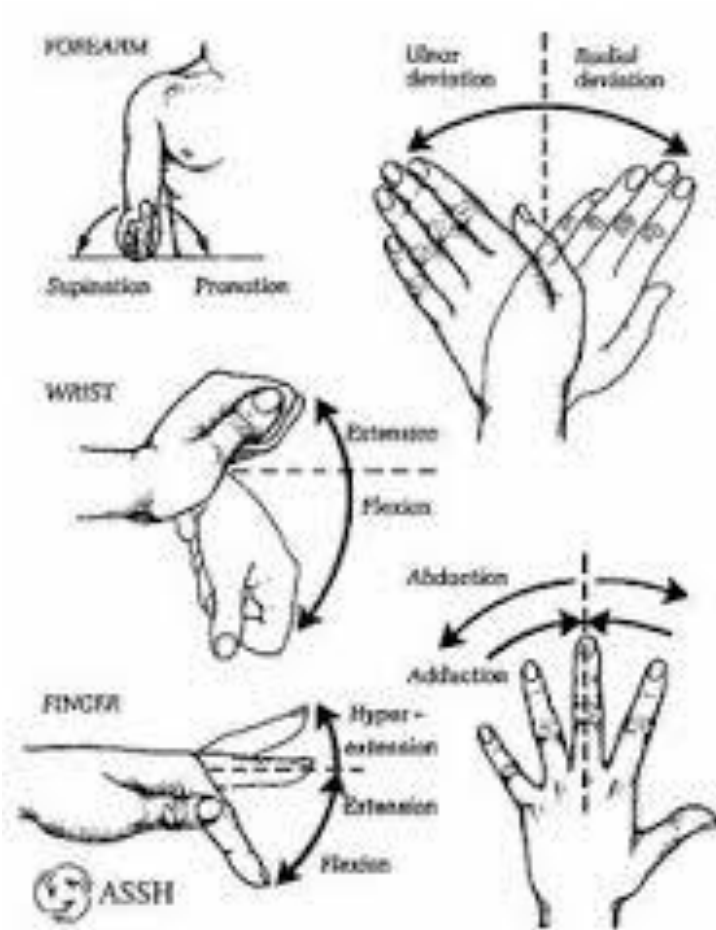
# Soft Tissue – Wrist

The wrist joint can:

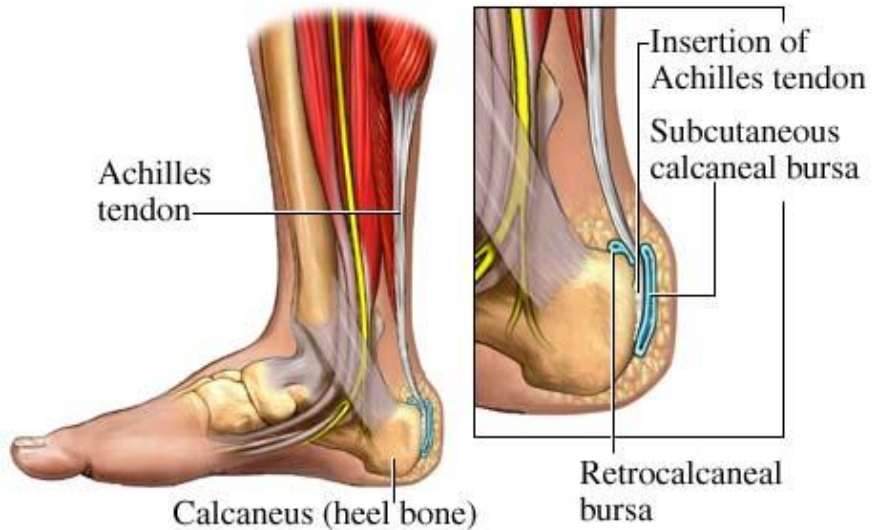
- ▶ Adduct
- ▶ Abduct
- ▶ Extend
- ▶ Flex
- ▶ Circumduct

Wrist extension occurs mainly at the midcarpal joint, while wrist flexion occurs mainly at the radiocarpal joint.

The wrist and hand are capable of extremely fine movement due to the number of muscles.



# Soft Tissue – Ankle



True ankle joint contains 3 bones.

- ▶ Tibia
- ▶ Fibula
- ▶ Talus

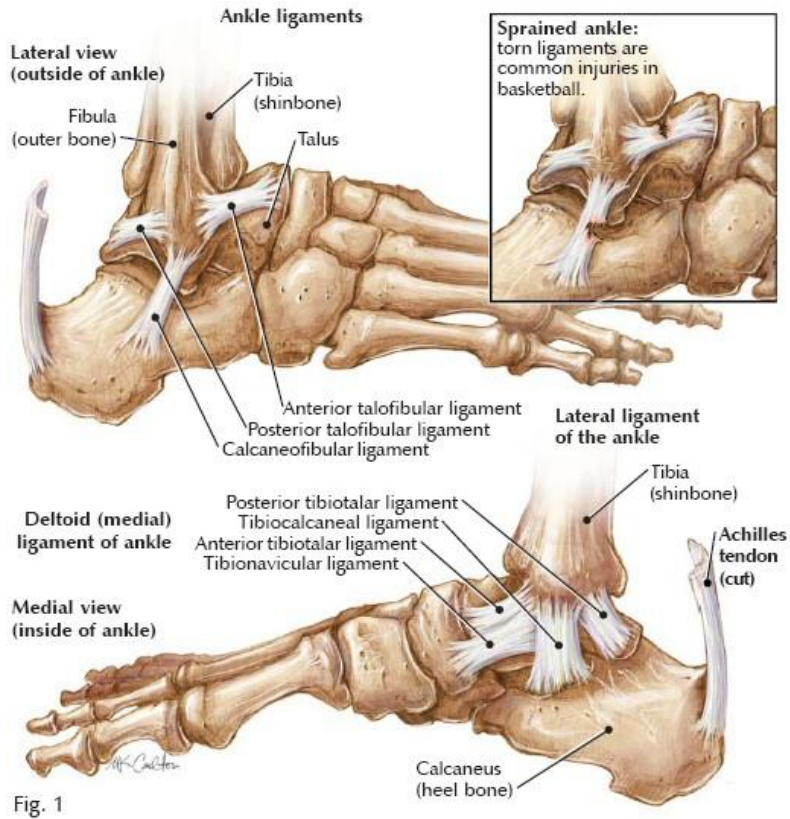
The true ankle joint allows dorsiflexion and plantar flexion.

The best known of the tendons moving the ankle is the **Achilles tendon** which runs down the back of the ankle.

This connects the muscles in the calf to the heel.

This tendon is often injured.

# Soft Tissue – Ankle



Underneath the true ankle joint is the **subtalar joint** which is composed of the talus and calcaneus.

**Subtalar joint** permits side-to-side motion

- ▶ On the lateral side
- ▶ **Tibiofibular ligament** attaches to the tibia and fibula
- ▶ The **lateral collateral ligaments** connect the fibula and the calcaneus
  - ▶ These ligaments provide lateral stability
- ▶ **Deltoid ligaments** joint the tibia to the talus and to the calcaneus
  - ▶ These ligaments stabilize the ankle medially

Excessive movement of the subtalar joint often leads to injuries to the ligaments.