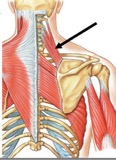
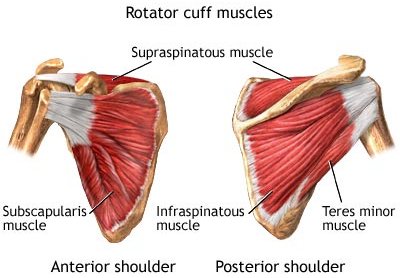
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Muscle** | **Origin** | **Insertion** | **Innervation** | **Action** |
| Trapezius | External occipital protuberance  Superior nuchal line  Ligamentum nuchae  Spinous process of CVII-TXII | Upper fibres – lateral 1/3 clavicle  Middle fibres – acromion  Lower fibres – spine of scapula | CNXI – Spinal part of Accessory nerve | - Elevates the scapula  - Rotates the scapula during aBDduction of the humerus above horizontal  - Middle fibres 🡪 retract scapula  - Lower fibres 🡪 depress scapula |
| Latissimus Dorsi | T6-T12  Iliac Crest  Thoracolumbar fascia  Inferior 3 ribs | Bicipital groove (intertubercular sulcus) of the humerus | Thoracodorsal nerve  C6, C7, C8 | Extends, aDDucts and medially rotates the upper limb |
| Levator Scapuli Superioris | C1-C4 transverse processes | Medial border of the scapula | Dorsal scapular nerve (branch of the brachial plexus) | Elevates the scapula |
| Rhomboid Major (inferior)  Rhomboid Minor (superior) | T2-T5 vertebrae | Posterior surface of medial border of scapula | Dorsal scapular nerve  (C4, C5) | Elevates and retracts the scapula |
| C7-T1 | Posterior surface of medial border of scapula | Dorsal scapular nerve  (C4,C5) | Elevates and retracts the scapula |

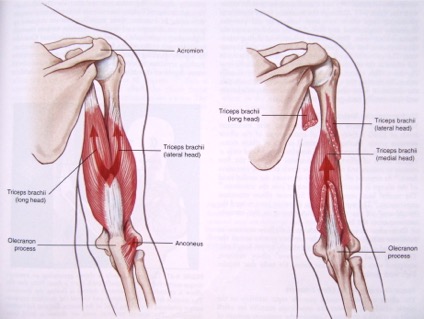


**Rotator cuff muscles**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Meaning** | **Origin** | **Insertion** | **Nerve Supply** | **Action** |
| Supraspinatus | Above spine of scapula | Medial 2/3rd of supraspinous fossa | Capsule of shoulder joint  +  **Greater tubercule of the humerus**  (most superior facet) | Suprascapular nerve  (C5, C6) | **aBDuction** of arm at glenohumeral joint |
| Infraspinatus | Below spine of scapula | Medial 2/3rd of infraspinous fossa | **Greater tubercle of the humerus**  (Lower down than supraspinatous) | Suprascapular nerve (C5,C6) | **Lateral rotation** at glenohumeral joint |
| Teres Minor  \*under the lower border of the teres minor, the axillary nerve leaves the axilla to enter the posterior compartment which lies across the posterior surface of the humerus. | Minor rounded muscle | Lateral border of the scapula | Capsule of shoulder joint  +  **Greater tubercle of the humerus**  (Below insertion of the infraspinatus) | Axillary Nerve  (C5,C6)  supplies:  deltoid  teres minor  long head of triceps brachii | **Lateral rotation** at glenohumeral joint |
| Subscapularis | Muscle below the scapula | Subscapular fossa | **Lesser tubercle** of humerus | Upper and lower subscapular nerves (C5, C6, (C7)) | **Medial rotation** of arm at the glenohumeral joint |



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Origin** | **Insertion** | **Nerve supply** | **Action** |
| Deltoid muscle  (anterior, middle and posterior) | Clavicle  Acromion  (bony process of the scapula)  Spine of scapula | Deltoid tuberosity of the humerus | Axillary nerve | Anterior fibres  **Flex** arm at the shoulder  Middle fibres  Major **aBDuctor**  (abducts the arm beyond the initial 15o done by the supraspinatus)  Posterior fibres  **Extend** arm at the shoulder |
| Teres Major  forms the inferior border of the quadrangular space – the ‘gap’ that the axillary nerve and the circumflex humeral artery pass through to reach the posterior scapula region | Posterior surface of the inferior surface of the scapula | Intertubecular/bicipital groove of the humerus | Lower subscapular nerve | aDDucts at shoulder  Medially rotates the arm |



**TRICEP MUSCLES**

**THE ONLY MUSCLE IN THE POSTERIOR COMPARTMENT**

**Three heads:**

Long head

Origin – infraglenoid tubercle

It is the most medial part of the triceps in the upper arm

Lateral head

Origin- posterior part of the upper third of the humerus

Medial head

Lays deeper than the other two and requires that the other two heads are dissected away

All three heads combine to make one muscle and they converge on to a tendon

**Actions:**

* **Extension** of the arm at the elbow

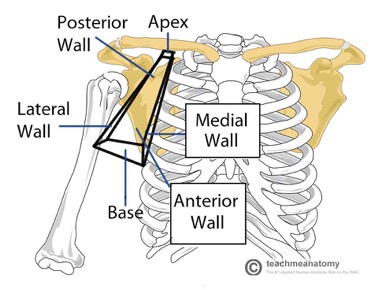
I**nnervation**:

* Radial nerve (C6,C7,C8 mainly C7)

**Blood supply**

* Profundi brachii

**SESSION 2 – AXILLA AND BRACHIAL PLEXUS**



**The axilla** – space between the trunk and the upper arm.

It is pyramidal shape and its boundaries are:

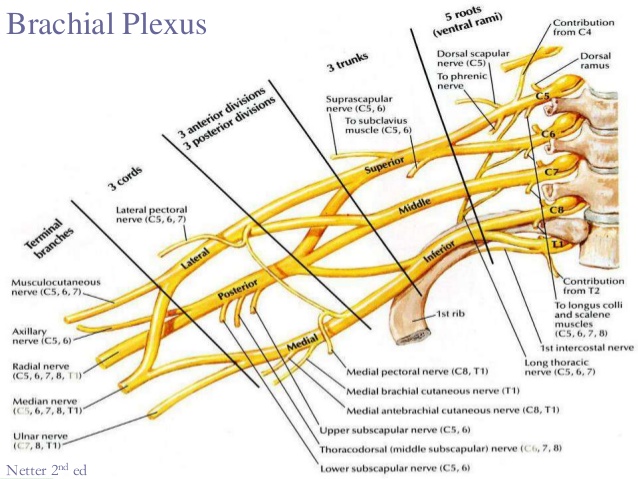
* ANTERIOR: pectoralis major and minor
* POSTERIOR: subscapularis, teres major, lattisimus dorsi muscles
* LATERAL- upper end of the humerus, biceps brachii, coracobrachialis
* MEDIAL – serratous anterior muscle
* APEX – first rib medially with clavicle in front and radial behind
* BASE – skin and deep fascia extending between the chest wall and the arm

**Axilla contains:**

* Fat
* Lymph nodes – drain into the mammary gland (milk producing gland of a woman)
* Axillary artery – major artery supplying the upper limb
* Axillary vein – major venous drainage of the arm
* Brachial plexus – major nerve plexus supplying the limb

**The Axillary sheath** – A fibrous sheath that encloses the following structures:

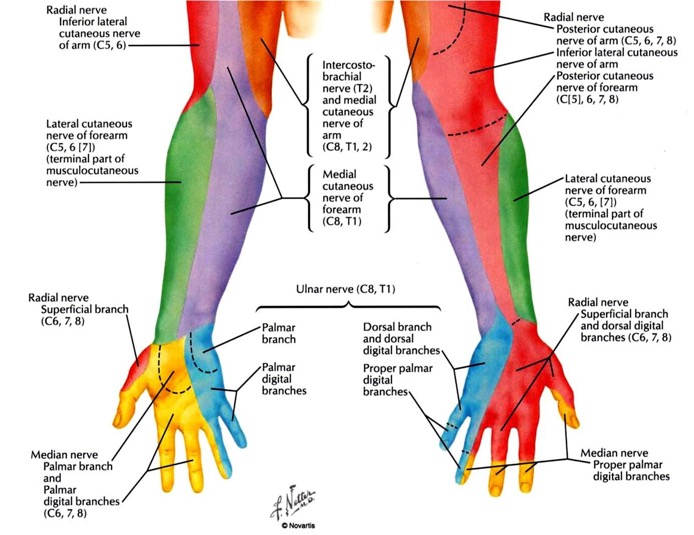
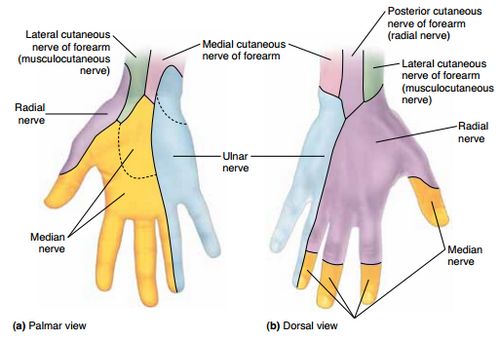
* Axillary artery – lies deep to pectoralis major
* Axillary vein (medial to the artery)
* Brachial plexus



**R**ead **T**hat **D**amn **C**adavar **B**ook

|  |  |  |  |
| --- | --- | --- | --- |
| **Branch** | **Root** | **Motor** | **Sensory** |
| Musculocutaneous | C5-C7 | Muscles in the **anterior compartment** of the **arm**  **FLEXORSSSSSS**   * Biceps brachii * Brachialis * Coracobrachialis | Skin on lateral side of the forearm |
| Axillary | C5 , C6 | Deltoid, Teres Minor | Skin over upper lateral part of the arm |
| Radial | C5-C8, T1 | Muscles in the **posterior compartment** of the **arm**  **EXTENSORSSSSS** | Skin on the posterior aspects of the arm and forearm  Lower lateral surface of arm  Dorsal lateral surface of the hand |
| Median (lateral and medial root | (C5 sometimes)  C6-T1 | Anterior forearm  All muscles in the **anterior compartment** of the **forearm**  **EXCEPT:**  *Flexor carpi ulnaris*  *Medial half of Flexor digitorum profundus*  *(supplies lateral half of flexor digitorum profundus)*  Hand  Intrinsic muscles of the hand & skin of palm  **LLOAF**  **LL. (lateral lumbricles)**  **O.A.F (three thenar muscles)**   * Opponens pollicis * aBductor pollicis brevis * flexor pollicis brevis | Skin over palmar surface of the lateral three and one half digits |
| Ulnar | C8, T1 | Anterior forearm   * flexor capri ulnaris * medial half of flexor digitorum profundus   Hand  All Intrinsic muscles of the hand & skin of palm  **EXCEPT:**   * *Three thenar muscles* * *Lateral lumbricles* | Skin over palmar surface – medial one and a half digits  Skin over dorsal surface- one and a half digits |
| Thoracodorsal | C6-C8 | Lattisimus dorsi | - |
| Long thoracic nerve | C5-C7 | Lies on the superficial aspect of the serratus anterior and supplies this muscle | |

**DERMATOMES - Sensory supply**



**Axillary Artery**

Blood vessel which conveys oxygenated blood to the lateral aspect of the thorax, the axilla and the upper limb. Its origin is at the lateral margin of the first rib before which it is called the subclavian artery

**Anterior Rotator Cuff Muscle**

* Subscapular Muscle

Origin 🡪 ventral surface of the scapula

Insertion 🡪 lesser tuberosity

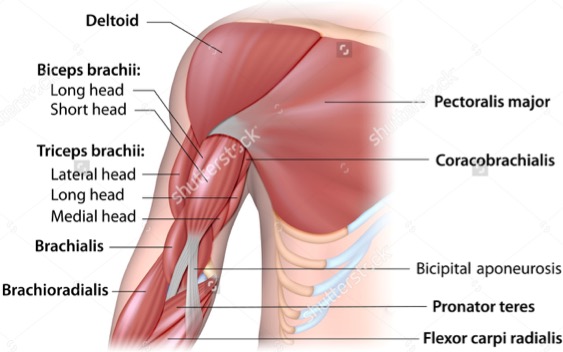
**MUSCLES IN THE ANTERIOR COMPARTMENT OF THE ARM**

**General Action - Flexors**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Origin** | **Insertion** | **Blood supply** | **Nerve supply** | **Action** |
| Biceps brachii | Long head- supraglenoid tubercule of scapula  Short head – coracoid process of scapula | Inserted by tendon into the **tuberosity of the radius** | Brachial Artery | Musculocutaenous nerve (Roots C5-C7) | **Supination** of **forearm**  **Flexor** of **arm** at the elbow and shoulder joint |
| Brachialis | Lower half of shaft of humerus | Coronoid process of ulna | **Flexor** at the **elbow** |
| Coracobrachialis | Coracoid process of scapula  \*the smallest muscle of three to come off of the coracoid process!  1) short head of biceps brachii  2) corocobrachialis  3) pectoralis minor | Medial side of humeral shaft | **Flexor** of **arm** at the shoulder joint (glenohumeral joint) |

**MUSCLES IN THE ANTERIOR COMPARTMENT OF THE ARM cont.**

**BBC: biceps brachii, brachialis, coracobrachialis**



NOTE:

* **Biceps brachii** – crosses shoulder and elbow joint

\*Note: **bicipital aponeurosis** is present I the cubital fossa and pays a role in separating superficial veins from the brachial artery and the median nerve

* **Coracobrachialis** – crosses shoulder joint

\*deep to the short head of biceps brachii

* **Brachialis** – crosses elbow joint

\*deep to the short and long head of biceps brachii

**SESSION 3 – ANTERIOR COMPARTMENT OF THE FOREARM AND PALM OF THE HAND**

**General actions**: FLEXION

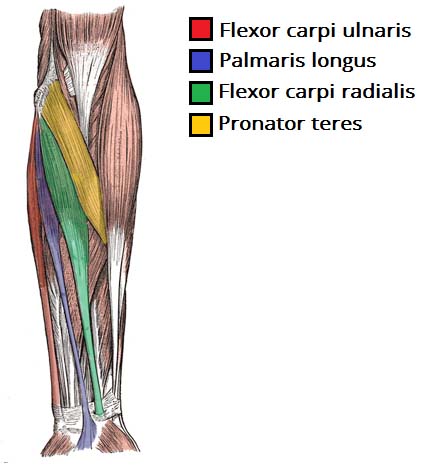
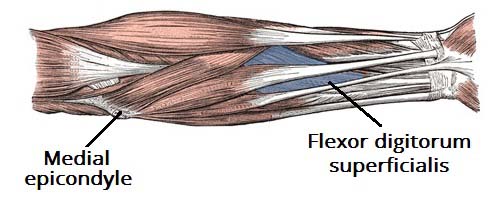
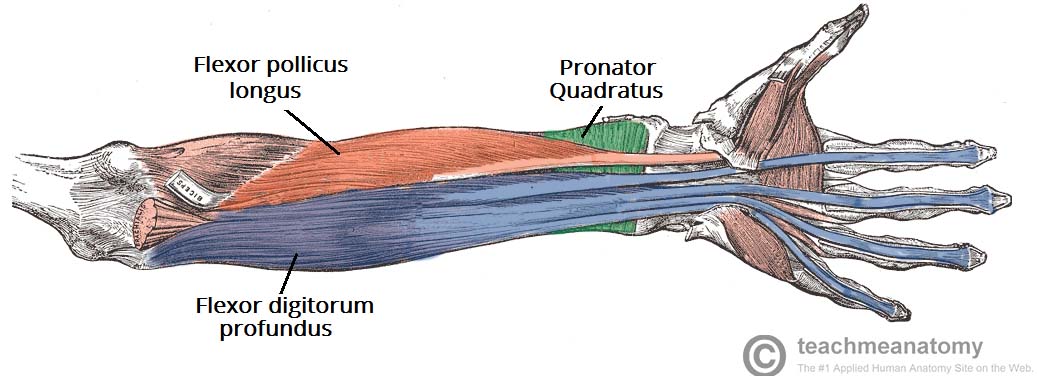
Flexors of the wrist, and fingers

Pronation of the forearm

**\*NOTE: The median nerve supplies all muscles in the anterior forearm apart from\***

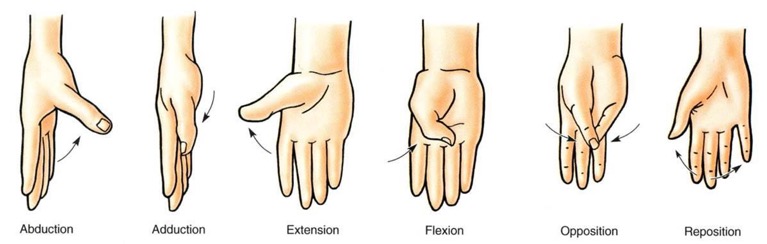
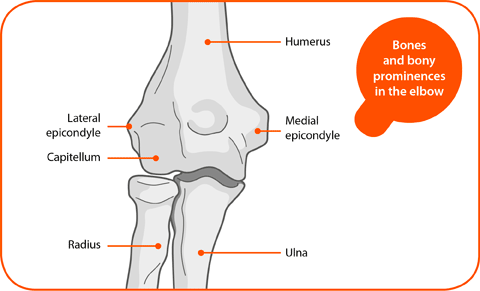
* **flexor carpi ulnaris**
* **flexor digitorum profundus**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Origin** | **Action** | **Innervation** |
| Superficial | | | |
| Pronator teres | Medial epicondyle of humerus | Pronation of forearm | Median nerve |
| Flexor carpi radialis | Flexor & aBduction of wrist |
| Palmaris longus | Flexion of the wrist |
| Flexor carpi ulnaris | Flexor & aBduction of wrist | Ulnar nerve |
| Intermediate | | | |
| Flexor digitorum superficialis | Medial epicondyle of humerus  +  Ulna | Flexion of the 4 fingers  +  Flexion of the wrist | Median nerve |
| Deep | | | |
| Flexor pollicus longus | Anterior surface of radius | Flexion of the thumb | Median nerve |
| Flexor digitorum profundus  *‘profundus = deep’* | Ulna | Flexion of the wrist + all interphalangeal joints | Median nerve (lateral half)  +  Ulnar nerve (medial half) |
| Pronator quadratus | Anterior surface of ulna | Pronation of the forearm | Median nerve |



Notes

**Movements of the thumb Bony prominences in the elbow**



**Epicondyles**: these are the parts that stick out of the humerus. The medial one is more larger and is the common point of origin for the superficial flexor muscles (purple table)

**Radius**:

**Humerus contribution**: if asked ‘’ does it articulate with the humerus’ it does as it touches against the **capitulum of the humerus** but it does not contribute to the hinge joint of the elbow, it just helps with pronation and supination

**Wrist joint contribution**: articulates with the carpals at the wrist (proximal row i.e. scaphoid and lunate) **‘’radiocarpal joint’’**

**Ulnar**:

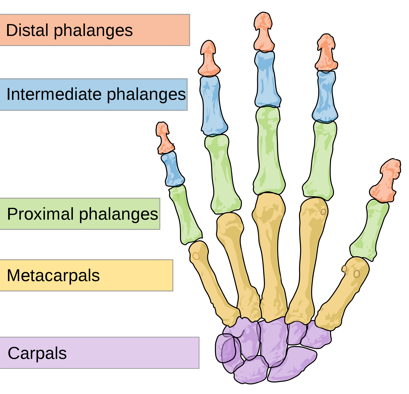
**Humerus contribution:** the ulnar articulates with the trochlear and therefore makes an evident contribution to the hinge joint

**Wrist joint contribution:** the ulnar does not do much at the wrist

**Interossesous membrane**

Between the ulnar and radius is interosseous membrane, which provides an additional area for muscles to attach to. It also provides stability to the forearm.

It connects to the interosseous crest

**Pollox** – proximal and distal phalanges

**4 fingers** – proximal, intermediate and distal phalanges

**MP joint**🡪 metacarpal phalangeal joint

**IP joint** 🡪 interphalangeal joint

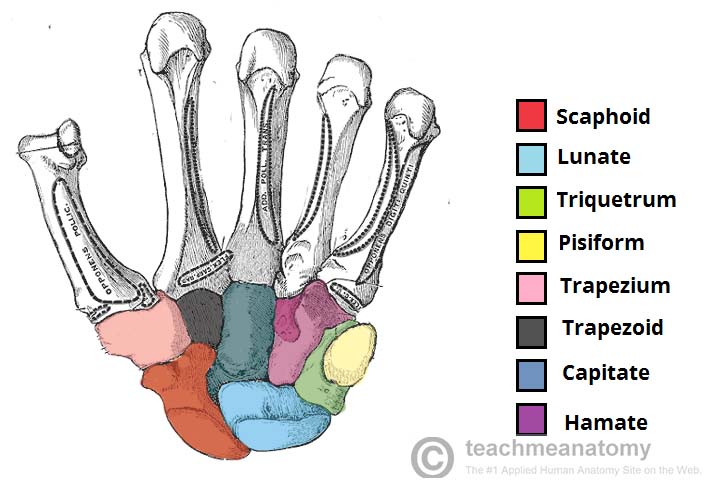
**Radius** - thumb side

**Ulnar** - opposite side to the thumb

**Extrinsic muscles of the hand** 🡪 origin is outside of the hand

**Intrinsic muscles of the hand** 🡪 origin and insertion are on the inside of the hand

**Carpal Bones**

**S**ome **L**overs **T**ry **P**ositions **T**hat **T**hey **C**annot **H**andle

**Proximal row (left to right)**

**S**caphoid (thumb side)

**L**unate

**T**riquetrum

**P**isiform (this is the pivital bone on the wrist, only seen from palmar aspect)

**Distal row (left to right)**

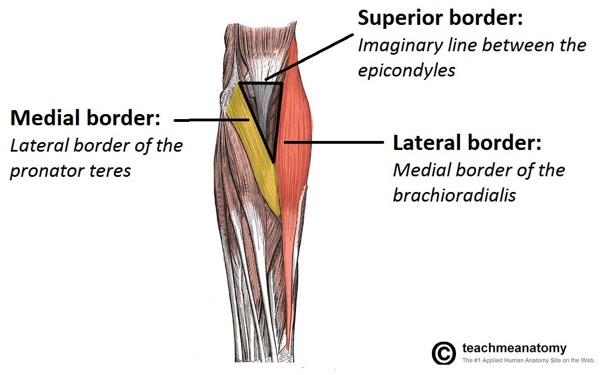
**T**rapezi**UM** (for the th**UM**b)

**T**rapezoid

**C**apitate

**H**amate

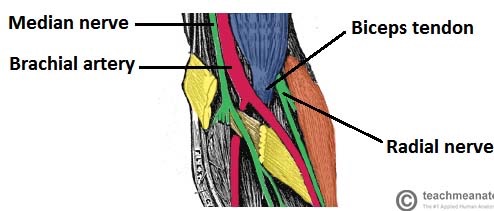
**The cubital fossa**



**Boundaries**

* **Lateral border *–*** The medial border of the brachioradialis muscle
* **Medial border** The lateral border of the pronator teres muscle
* **Superior border***–* An imaginary line between the epicondyles of the humerus.

Clinical: Superficial veins are usually used here for intravenous injections.



**Contents**

-Biceps tendon

-Radial nerve

-Median nerve

Leaves the cubital fossa by going through the pronator teres (between the superficial and deep head)

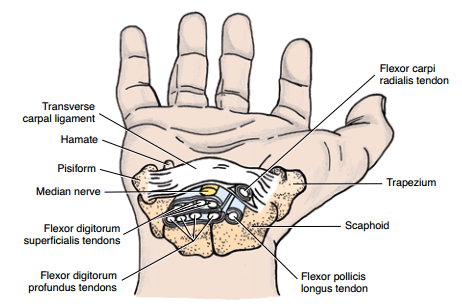
-Brachial artery

Bifurcates into the radial and ulnar arteries at the apex of the cubital fossa

**Palm of the Hand**

* Palmar fascia lies immediately deep to the skin of the palm and extends from the **flexor retinaculum of the wrist** and and is attached to the flexor sheath of each finger.
* In manual workers, the fascia can progressively scar leading to shortening of the fascia which pulls the finger into flexion

**Carpal Tunnel Syndrome**

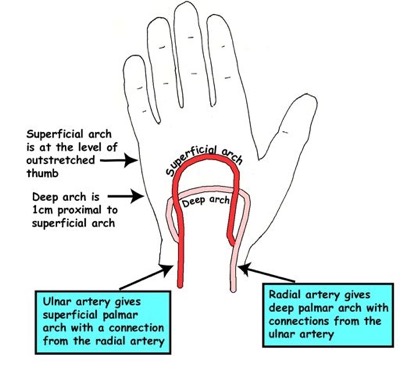
**Carpel tunnel**: a space between the flexor retinaculum of the wrist and the carpal bones of the wrist.

Contains:

* flexor superficialis/profundus tendons
* flexor pollicus longus tendon
* flexor carpi radialis tendon
* **median nerve**

Swelling of the tendons or arthritis affecting joints of the carpal bones can increase pressure in the tunnel therefore compressing the median nerve.

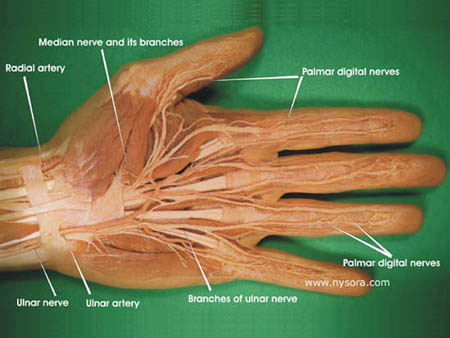
This leads to pain and **diminished sensation on the skin along the distribution of the median nerve as well as weakness of the thenar muscles, which** are also supplied by the median nerve.

 The **ulnar nerve** lies **superficial** to the **retinaculum** and is therefore **not affected**

**The superficial palmar arch – formed predominanty by the ulnar artery**

Represents the termination of the ulnar artery with a small contribution from the radial artery. It is deep to the palmer fascia over the tendons and nerves to the fingers

**The deep palmar arch –** **formed predominantly by terminal part of the radial artery**

**Median and Ulnar nerves**

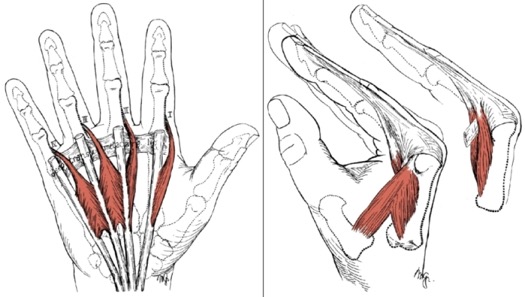
* Both supply intrinsic muscles of the hand and the skin of the palm of the hand
* **Palmar digital branches** – wind round the fingers to supply the skin on the dorsum of the terminal phalanges
* **Palmar cutaneous branches of the ulna and median nerve**

Supply the skin on the palm of the hand

In injuries of the median or ulnar nerves at the wrist, these palmar branches may escape damage and hence sensation in the palm of the hand may not be affected.

**SENSATION OF THE PALM OF THE FINGERS WILL BE AFFECTED.**

**Lumbrical Muscles**



* 4 lumbrical muscles, one for each finger
* **Origin**: flexor digitorum profundus tendon 🡪 crosses the metacarpophalangeal joint 🡪 **Insertion**: dorsal digital expansion at the back of the finger

**Action:** simultaneously flex the metacarpophalangeal and extend the interphalangeal joints

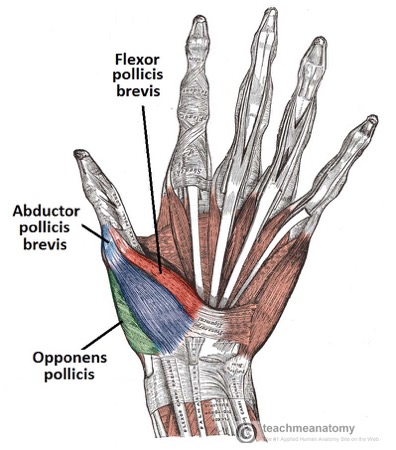
**Innervation:**

Two lateral lumbricals: median nerve

Two medial lumbricals: ulnar nerve

**The Thenar Muscles**

Muscles are important in producing grip or pincer’s grip as in holding a pen.

* opponens pollicis
* aBductor pollicis brevis (longus is in the posterior aspect of the arm on the deep layer)
* flexor pollicis brevis

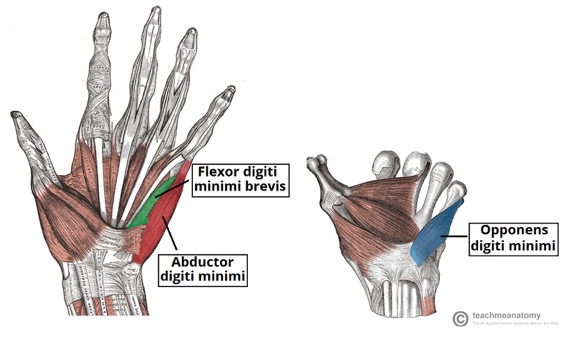
Innervation: Median nerve

* ADductor pollicis

This is located more medially

Innervation: Ulnar nerve

**The Hypothenar Muscles**



* Opponens digiti minimi
* aBductor digiti minimi
* flexor digiti minimi

Innervation: ulnar nerve

**Insertions of the flexor tendons**

Flexor digitorum superficialis

* tendon splits to be attached to each side of the middle phalanx.

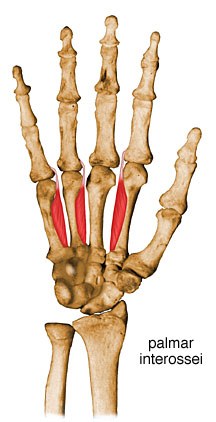
Flexor digitorum profundus

* tendon passes between the gap in the superficialis tendon to insert into the terminal phalanx

Flexor pollicus longus

* tendon inserts to the base of the terminal phalanx of the thumb

\* tendons are held on to the front of the finger by the fibrous flexor sheath



**Interossei muscles**

Lie between the metacarpal bones

3 Palmar interossei 🡪 aDduction of fingers by moving them towards the middle finger

*‘’ 3 to me, PAD = palmar, aDduction’*

4 Dorsal interossei 🡪 aBductors of the fingers by moving them towards the middle finger

*‘’ 4 to the floor, DAB = dorsal aBduction’*

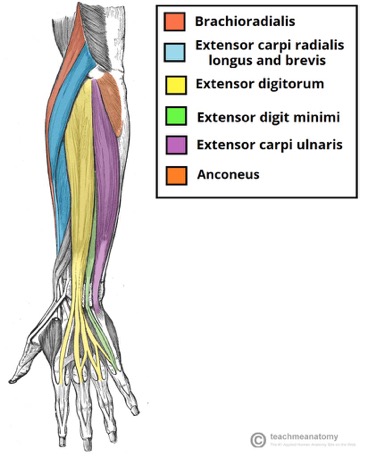
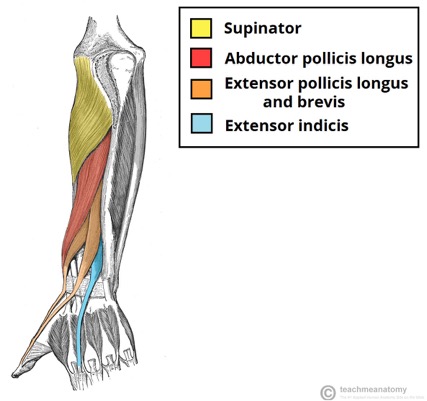
Innervation: ulnar nerve

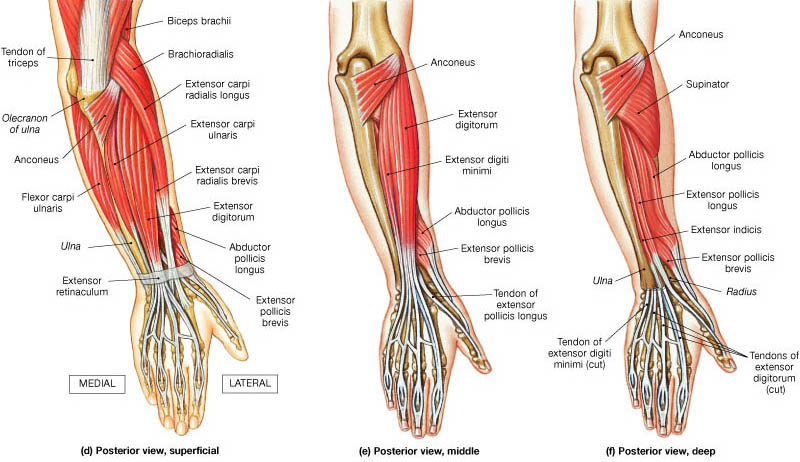
**SESSION 4: POSTERIOR FOREARM, DORSUM OF HAND AND JOINTS OF UPPER LIMB**

**Note: no tendons here insert into the phalanges. They inset into the base of the sheet of connective tissue.**

**General Action: Extension**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Origin** | **Insertion** | **Innervation** | **Action** |
| **Superficial (5)** | | | | |
| Extensor carpi radialis longus  Extensor carpi radialis brevis | Back of lateral epicondyle of humerus | 2nd and 3rd metacarpal bones | Radial nerve  \*brachioradialis is supplied by a branch of the radial nerve just above the elbow | **Extension** and **aBduction** at the **wrist** |
| Extensor digitorum | Splits into 4 + inserts into extensor hood each finger | **Extends** **fingers 2-5** |
| Extensor digiti minimi | Into extensor hood of each finger | **Extends little finger** |
| Extensor carpi ulnaris | 5th metacarpal bone | **Extension** and **aDduction** |
| **Deep (4)** | | | | |
| **Extensor pollicis longus** |  |  | Radial nerve | **Extends** the **thumb** |
| **Extensor pollicis brevis** |  |  | **Extends** the **thumb** |
| Abductor pollicis longus  \*brevis is in the thenar group\* |  |  | **aBducts** the **thumb** |
| Extensor indicis |  |  | **Extention** of the **index finger** |





**Supinator**

Does not really belong to the superficial or the deep layers

**Origin** 🡪 lateral epicondyle of humerus

**Insertion** 🡪 lateral surface and posterior border of radius

**Action:** supinates the forearm

**Brachioradialis**

**Origin 🡪** proximal aspect of the lateral supracondylar ridge of the humerus

**Insertion 🡪** distal end of the radius

**Action:** flexion at the elbow

\* think of the awkward hand movement izzie was doing! (think of someones hand in a sling being the original position and then the forearm moves upwards from there)

Clinical relevance

**Wrist drop**

* Paralysis of the **radial nerve above the elbow** will paralyse all the extensors of the wrist. The flexors of the wrist will pull the wrist into a flexed position.

**Anatomical stuff box**

\*NOTE: THESE TERMS ARE USED IN THE CONTEXT OF THE ANATOMICAL POSITION WHERE THE **FOREARM IS SUPINATED**.

* Anterior/lateral (radial) border

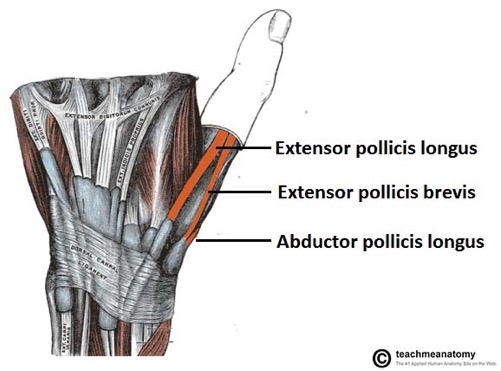
Extensor pollicis brevis

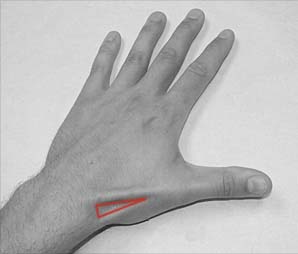
Abductor pollicis longus

* Posterior/medial (ulnar) border

Extensor pollicis longus

The radial artery lies in it and the cephalic vein crosses it. After a fall on the outstretched hand, tenderness in the anatomical stuff box is suggestive of a fracture of the scaphoid bone. The whole bone is supplied by a single artery which enters the one from the distal end. If the scaphoid fractures, the proximal end of the bone may be disconnected from the blood supply and will undergo ‘avascular necrosis’.

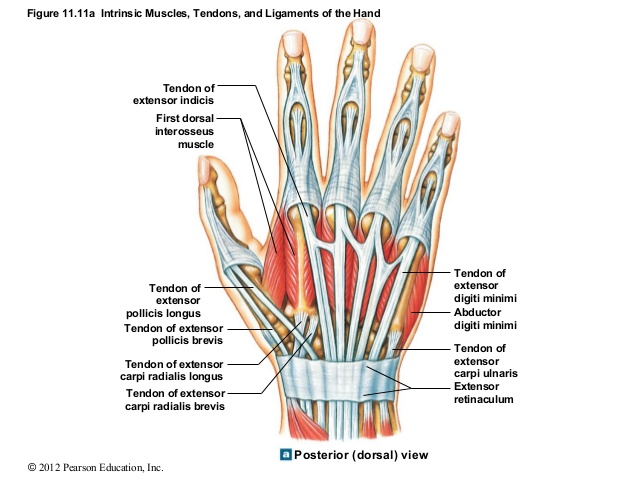


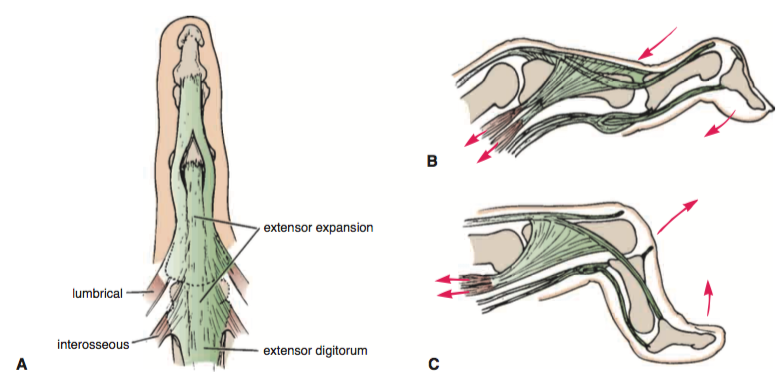


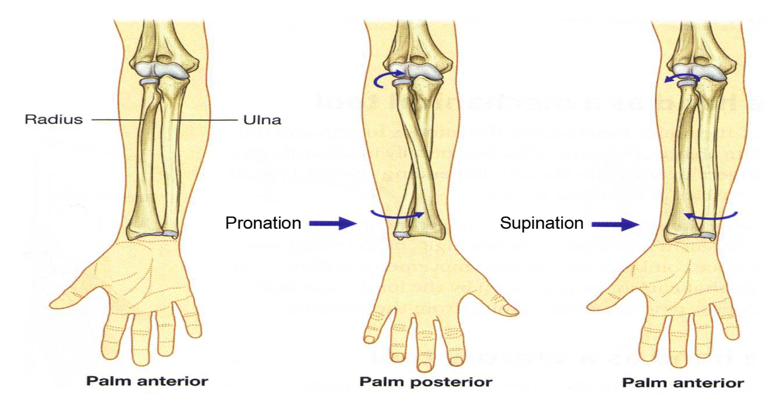
**The extensor expansion**

At the wrist, the extensor digitorum gives rise to four tendons which supplies digits 2-5. Each slip forms an expanded hood over the dorsum of the digit. The expansion is attached to the base of proximal phalanx before dividing into a central and two marginal slips.

* central slip is inserted to the base of the middle phalanx
* marginal slips unite together and inserts into the base of the distal phalanx





**The joints of the upper limb**

**Joints of the elbow**

Flexion and extension movements of the forearm take place at the elbow joint.

**Main flexors**: brachialis, biceps and brachioradialis

Common flexor origin– medial epicondyle

**Main extensors**: triceps

Common extensor origin – lateral epicondyle

At the radio-ulnar joints:

**Pronation**

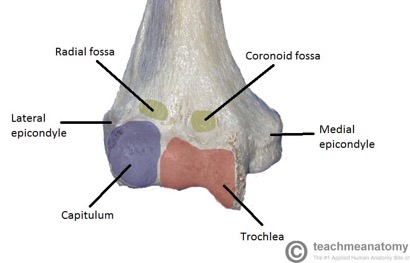
* The radius moves inwards. Pronation is produced by the pronator teres and the pronator quadratus

**Supination**

* The radius moves outwards
* In the **flexed** position of the **elbow**, **biceps** acts as a **powerful supinator**.
* When the **elbow** is **extended**, **supinator** is responsible for supination although it is weak

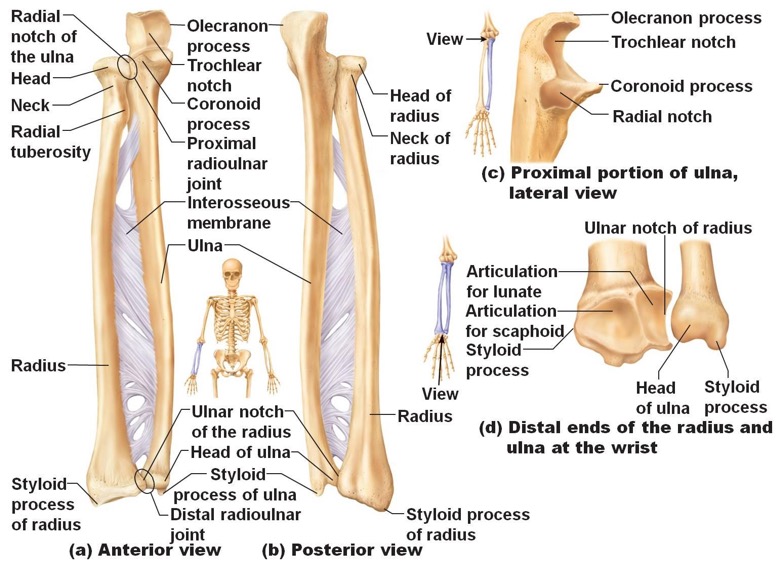
**Humerus**

* Medial and lateral epicondyles huemerus
* Capitulum and trochlea of the humerus **(radius articulates with the capitulum and the trochlea fits into the trochlear notch of the ulna)**
* Cornoid fossa of the humerus

****

**Ulnar nerve**

Passes into the forearm along the posterior aspect of the medial epicondyle

\*Important points

**Radius**

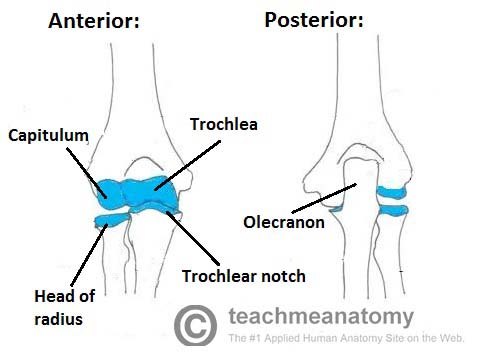
Head and neck of radius

Tuberosity of radius

**Ulna**

Cornoid and olecranon process of the ulna

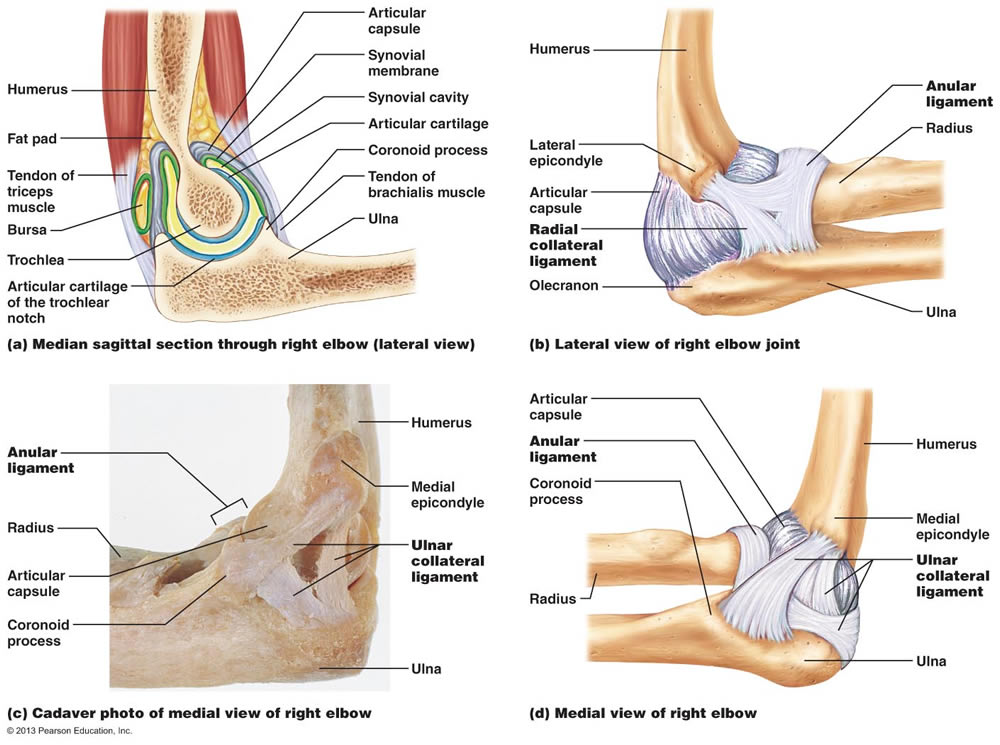
Trochlear notch on the ulna



**In the elbow joint:**

Radius articulates with the capitulum of the humerus

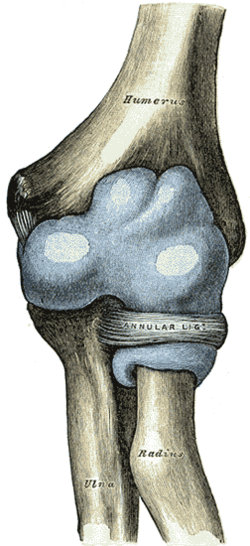
Humerus fits into the trochlear notch of the ulnar



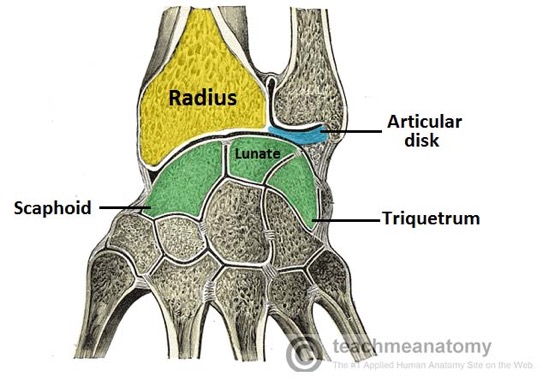
The elbow joint is a **synovial joint.**

* Like all synovial joints, the elbow joint has a capsule enclosing the joint which strengthens the joint.
* The joint capsule is thicken medially and laterally to form collateral ligaments which stabilise the flexing and extending motion of the arm.
* **Radial collateral ligament:** found on the lateral side of the joint extending from the lateral epicondyle and blending in with the anular ligament
* **Ulnar collateral ligament:** originates from the medial epicondyle and olecranon of the ulnar

**Annular ligament:**



The annular ligament is a strong band of fibre that encircles the head and neck of the radius and retains it in contact with the radial notch of the ulna.

**The Wrist Joint**

At the wrist joint, the scaphoid, lunate and triquetral bones articulate proximally with the distal end of the radius.

The triangular fibrocartilage separates the wrist joint from the inferior radioulnar jpint

**SESSION 5: THE LOWER LIMB**

Quick overview…

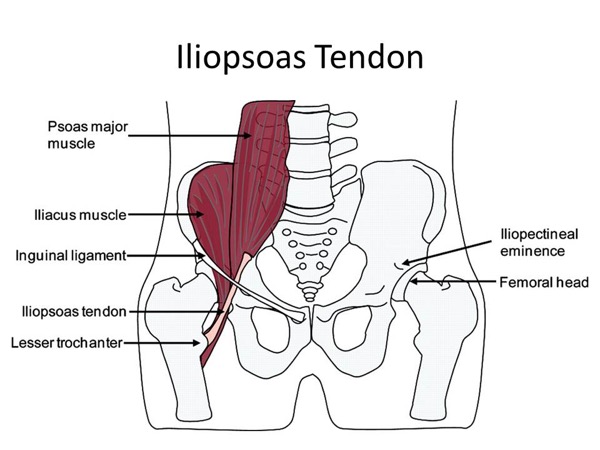
|  |  |  |  |
| --- | --- | --- | --- |
| **Compartment** | **Muscles** | **Action** | **Innervation** |
| Anterior | Iliopsoas  Different action, look below  Quadriceps femoris:   * Vastus lateralis * Vastus intermedialis * Vastus medialis * Rectus femoris   Sartorius  Pectineus\*  this compartment in terms of nerve supply | Flexion of thigh at the hip  Main action – extension of the leg at the knee | Femoral nerve  (L2-L4) |
| Medial | aDductors magnus  aDductor longus  aDductor brevis  obturator externus\*  gracialis | Hip aDductors | Obturator nerve (Lumbar plexus)  Blood supply : obturator artery |
| Posterior | Biceps femoris  Semitendinosus  Semimembranosus | Extend at the hip  Flex at the knee | Sciatic nerve (L4-L3) |

**Lower limb: Anterior compartment of the thigh**

**General Action: extension of the leg at the knee**

**Nerve supply:** femoral nerve

**Blood supply:** femoral artery

**Iliopsoas**

Consists of two muscles:

* Psoas major
* Iliacus

Unlike the other anterior thigh muscles, it does not extend the leg at the knee

Origins

Psoas major: lumbar vertebrae

Iliacus – iliac fossa of the pelvis

Insertions

Lesser trochanter of the femur

Actions

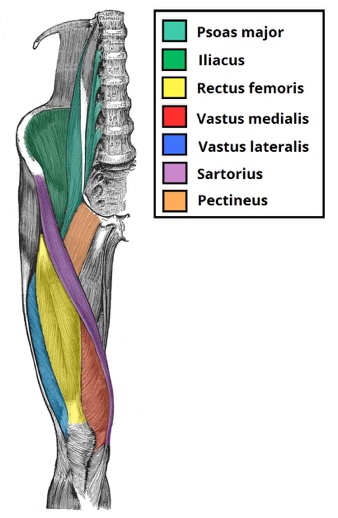
Flexes the lower limb at the hip joint and assists in lateral rotation at the hip joint

Innervation

Psoas major: anterior rami of L1-3

Iliacus: femoral nerve

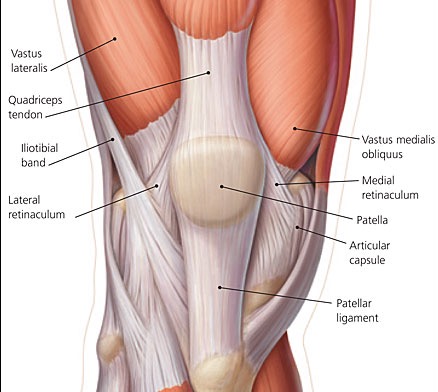
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Muscle** | **Origin** | **Insertion** | **Action** | **Innervation + Blood Supply** |
| **Quadriceps femoris** | | | | |
| Rectus femoris | Femur | Patella via the quadriceps femoris tendon | -Flexes at leg and hip joint  -Extension of leg at the knee  \* only muscle of quadriceps to cross both the hip and knee joint | Femoral nerve  Femoral artery |
| Vastus lateralis | Greater tronchanter & lateral lip of linea aspera |  | Extension of leg at the knee + stabilises patella | Femoral nerve  Femoral artery |
| Vastus intermedius | Anterior and lateral surface of femoral shaft |  | Extension of leg at the knee + stabilises the patella | Femoral nerve  Femoral artery |
| Vastus medialis | Intertronchanteric line and medial lip of the linea aspera |  | Extension of leg at the knee + stabilises the patella | Femoral nerve  Femoral artery |
| Sartorius (located superficially) | | | | |
| - | ASIS | Superior medial surface of tibia | Hip joint: flexor, aBductor, lateral rotator  Knee joint: flexor | Femoral nerve |
| Pectineus | | | | |
| - |  |  | aDuction and flexion at the hip joint | Femoral nerve |



**Note:**

**Ligaments: attach bones to bones**

**Tendons: muscles to bones**



**Quadriceps Femoris:**

* Consists of four individual muscles, three vastus muscles and the rectus femoris

(check table)

* The muscles that form quadriceps femoris distally attach to the patella via the

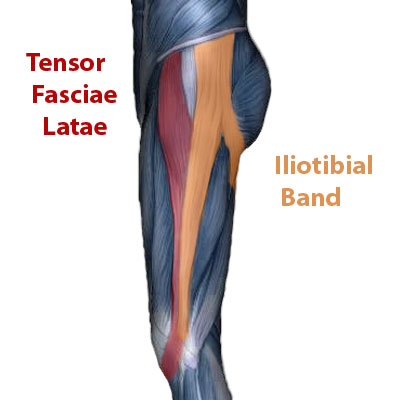
patella tendon/quadriceps tendon (both the same thing)

**Patella**

* Ligamentum patella/Patella ligament:

Connected to the lower end of the patella and attaches into the tibial tuberosity

---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



**Tensor Fascia lata & iliotibial traxt**

**Fascia lata** 🡪 runs from the iliac crest and inserts into the tibia

**Iliotibial tract** 🡪 a longitudinal fibrous reinforcement of the fascia latae

Actions:

Extend, aBduct and laterally rotate the hip

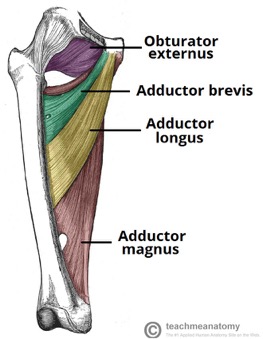
**Lower limb: Medial Compartment of the Thigh**

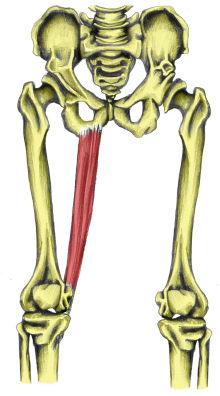
**General Action:** aDduction at the hip

**Nerve innervation:** obturator nerve

**Blood supply:** obturator artery

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Muscle** | **Origin** | **Insertion** | **Action** | **Innervation** |
| ADductor longus | Pubis | Linea aspera of the femur | aDuction and medial roation of the thigh | Obturator nerve  L2-L4 |
| ADductor brevis  \*lies underneath adductor longus and lies between the anterior and posterior divisions of the obturator nerve | Body of pubis and inferior pubic rami | Linea aspera of the femur | aDduction of the thigh | Obturator nerve  L2-L4 |
| ADductor magnus  \*largest muscle in the compartment and lies posteriorly to the other muscles | * aDuctor part   inferior rami of the piubis   * Hamstring part   Ischeal tuberosity | * aDuctor part   linear aspera of the femur   * Hamstring part   Adductor tubercle | aDuction of thigh  aDductor compartment: flexes thigh too  hamstring compartment: extends thigh too | Obturator nerve  L2-L4 |



**Gracilis**

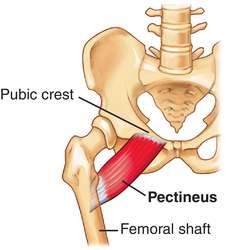
This is the most superficial and medial in this compartment. It crosses at both the hip and knee joint

**Origin**: inferior rami of the pubis and body of the pubis

**Insertion:** medial surface of the tibia

**Action**: aDuction of thigh at the hip, flexion of the leg at the knee

**Innervation:** Obturator nerve (L2-L4)



**Pectineus muscle**

Origin – pectineal line on the anterior surface of the pelvis

Insertion – below the lesser trochanter of the femur

Actions – aDdction and flexion at the hip joint

Innervation – Femoral nerve. May also receive a branch from the obturator nerve

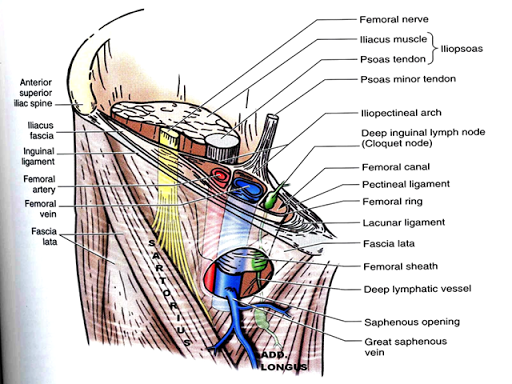
**The adductor (sub-sartorial) canal**

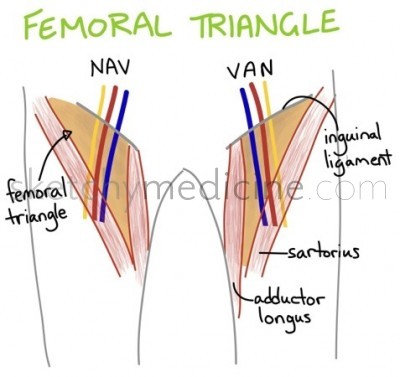
* You can find the opening to the sub-sartorial canal deep to the Sartorius muscle.
* It extends from the apex of the femoral triangle and ends just above the knee at the adductor canal

**Contents:**

* Saphenous nerve: *a large superficial vein which overlays the femoral triangle. The position of the long saphenous vein is constant and it the primary site for varicose veins and can be used in cardiac and limb bypass surgery.*
* Femoral artery
* Femoral vein
* Lymphatic and loose connective tissue

The femoral artery and vein follow the sub-sartorial canal to where they pass through adductor magnus into the popliteal fossa at the back of the knee.

**Femoral triangle**



Contents:

* Femoral nerve
* Femoral artery
* Femoral vein
* Lymph canal
* The great saphenous vein drains into the femoral vein within the triangle

Way to remember content:

NAVEL

Nerve

Artery

Vein

Empty space

Lymph canal

Order of vessels:

NAV Y VAN

Vein near vagina!

Venous near the penis!

Femoral vein and artery carry on and travel through to the popliteal fossa. Once they have entered, they become the popliteal artery and popliteal vein

**SESSION 6: THE GLUTEAL REGION AND POSTERIOR COMPARTMENT OF THE THIGH**

**Gluteal Region**

The muscles within the gluteal region can be broadly divided into two groups:

**Superficial aBductors and extenders of the femur**

**Innervation: Superior and Inferior gluteal nerves**

* Gluteus maximus
* Gluteus medius
* Gluteus minimis
* Tensor fascia lata

**Deep lateral rotators (do not need to know much about this. Just recognise the name)**

Quaratus femoris

**Piriformis**

Gemellus superior

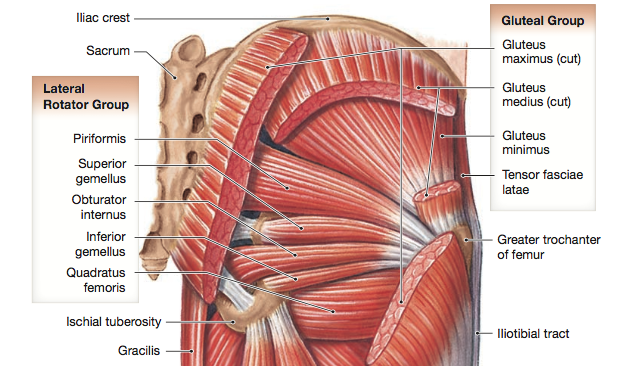
Gemellus inferior

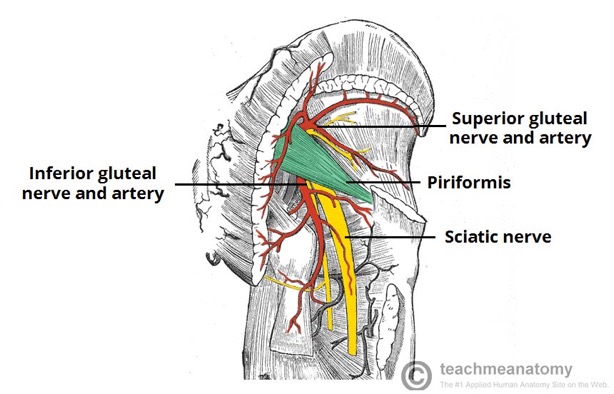
Obturator internus

**Note:** **the inferior and superior gluteal arteries both emerge from the obturator foramen**

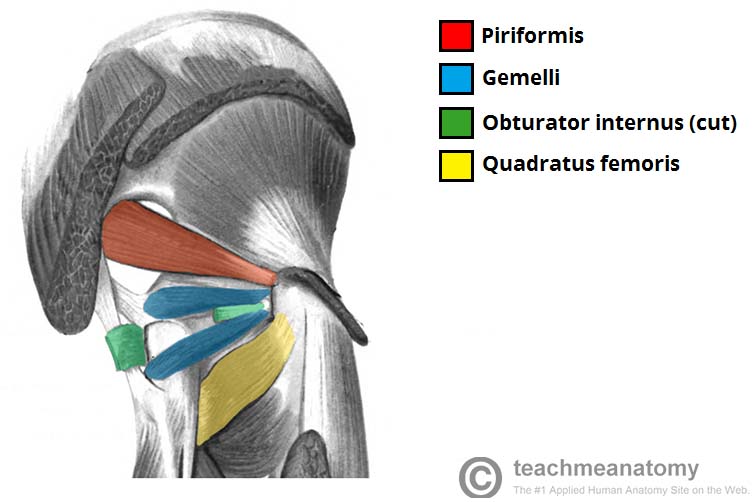
**Gluteal Region: Superficial Muscles**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Muscle** | **Origin** | **Insertion** | **Action** | **Innervation** |
| **Superficial** | | | | |
| Gluteus Maximus  \*Fibres slope laterally and downwards | Gluteal (posterior) surface of the ilium, sacrum and coccyx | Iliotibial tract  &  greater tronchanter of the femur | Extensor of thigh  &  Assists with lateral rotation (only used when force is required) | Inferior gluteal nerve |
| **Deep** | | | | |
| Gluteus Medius | Gluteal surface of ilium | Greater trochanter | aBducts + medially rotates the thigh | Superior gluteal nerve |
| Gluteus Minimus | ilium | Greater trochanter | aBducts + medially rotates the thigh | Superior gluteal nerve |





**Deep lateral rotators: Just focused on main one….**



**Piriformis**

This is the most superior of the deep muscles.

**Origin**: anterior surface of the sacrum

Insertion: travels through the greater sciatic foramen to insert into the greater trochanter of the femur

**Action**: Lateral Rotation and aBduction

**Innervation**: Nerve to piriformis

**Posterior Compartment of the Thigh ‘’Hamstrings’’**

**Action:** Extension at the hip, flexion at the knee

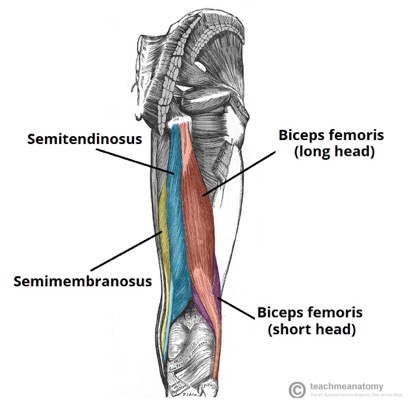
**Innervation:** Sciatic nerve (L4-S3)

3 originate from ischial tuberosity of the pelvis:

* Long head of biceps femoris
* Semitendinosus
* Semimembranosus

All 4 cross the knee joint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Muscle** | **Origin** | **Insertion** | **Action** | **Innervation** |
| Biceps Femoris (short head) | Linea aspera of femur | Heads form a tendon and insert into the head of the fibula | Flexion of the leg at the knee | Sciatic nerve |
| Biceps Femoris (long head) | Ischial tuberosity |
| Semitendinosus | Ischial tuberosity | Medial condyle of tibia | Flexion of the leg at the knee  Extension of thigh at hip |
| Semimembranosus | Ischial tuberosity | Medial condyle of tibia | Flexion of the leg at the knee  Extension of thigh at him |



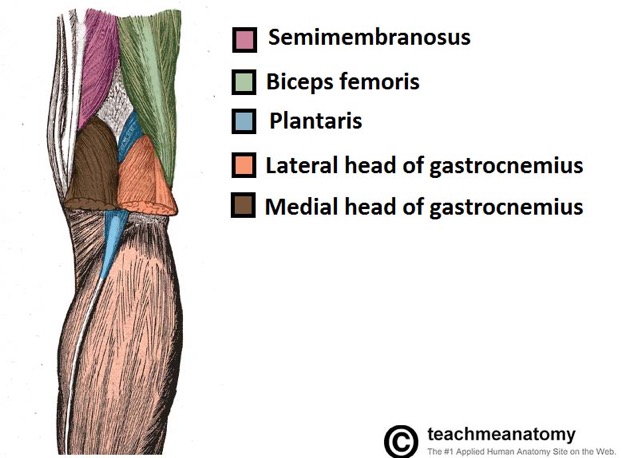
**Lateral Aspect:**

Biceps femoris (long head and short head)

**Medial aspect:**

Semitendinosus (tendon is present which makes is distinguishable from semimembranosus)

Semimembranosus (most medial, VERY THICK)

**Popliteal Fossa**

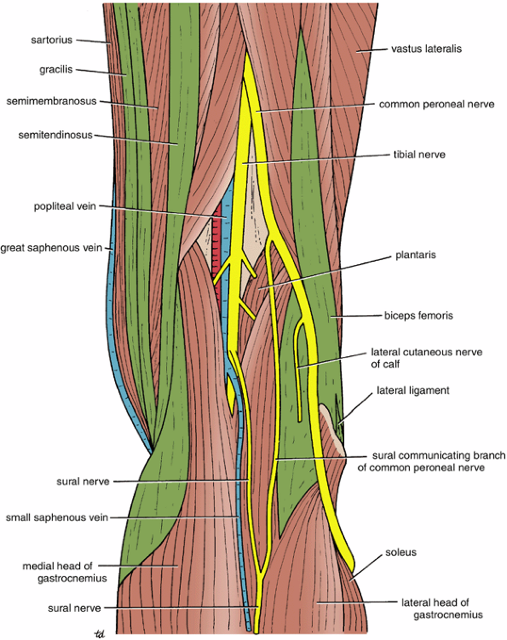
**Sciatic nerve**

The nerve emergences from under the piriformis (deep to the gluteus maximus), runs under the long head of biceps femoris and between the lateral and medial posterior thigh muscles to enter the popliteal fossa.

It ends in two terminal division:

* Tibial nerve
* Common peroneal nerve

**Borders:**

Superiomedial borders: semimebranosus

Superiolareal border: biceps femoris

Inferiomedial border: medial head of gastrocnemius

Inferiolateral border: lateral head of gastrocnemius

**Content (medial to lateral)**

Popliteal artery

Popliteal vein

Tibial nerve

Common peroneal nerve

\*NOTE

**Tibial nerve** 🡪 continues south and innervates the posterior aspect of the leg and travels into the plantar surface of the foot

**Common peroneal** 🡪 this has a superficial branch and a deep branch

- superficial branch: lateral compartment of the leg

- deep branch: anterior compartment of the leg

**\*vessels emerge from adductor hiatus and leave between the heads of gastrocnemius**

**Small saphenous vein**

The small saphenous vein pierces the popliteal fascia of the popliteal fossa to enter the ‘diamond’ and empty into the popliteal vein.

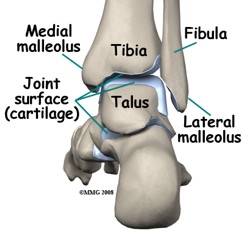
**SESSION 7: ANTERIOR AND LATERAL COMPARTMENTS OF THE LEG AND DORSUM OF THE FOOT**



**Movements of the foot:**

* Dorsi flexion
* Plantar flexion
* Eversion
* Inversion

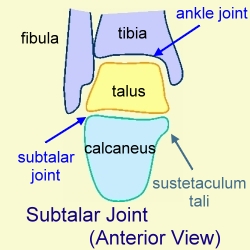
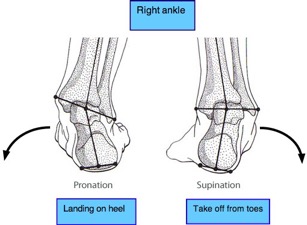
\*Eversion and inversion are based on the direction in which the sole of the foot is pointing



**Tibiotalus joint**

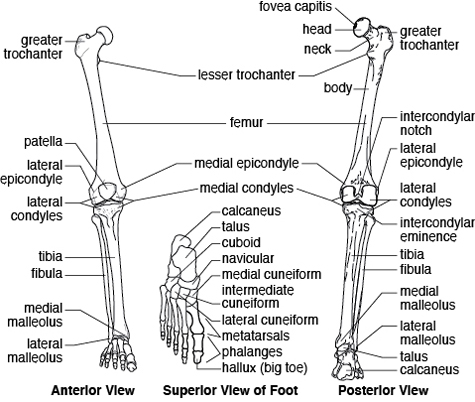
* tibia and tallus articulation

Dorsi and Plantar Flexion take place here

**Subtalar joint**

This is where the talus articulates with the calcaneum and the navicular

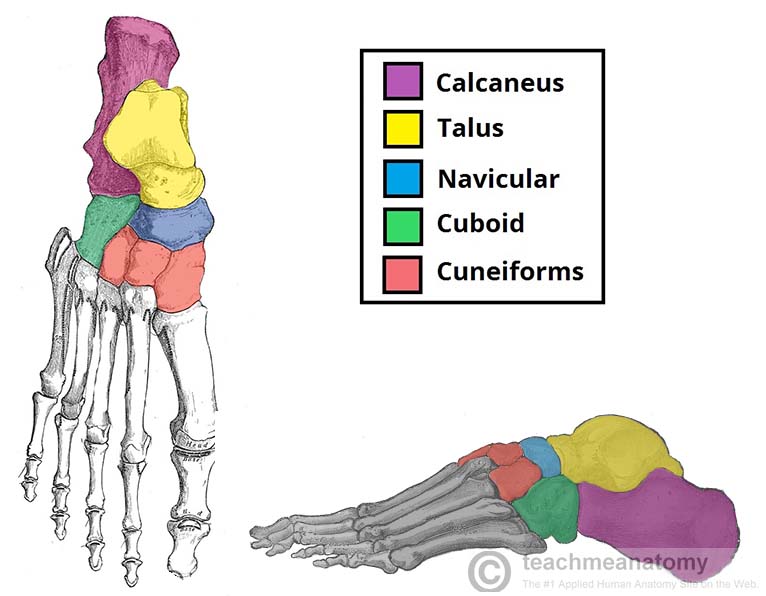
Eversion and Inversion take place here

**Important points:**

The tibia articulates directly with the femur

The fibula articulates directly with the tibia

Just like the ulnar and radial bones, the tibia and fibula have an interosseous membrane



Foot has **7 Tarsels**

**T**he **C**ircus **N**eeds **M**ore **I**nteresting **L**ittle **C**lowns.

**T:** Talus

**C:** Calcaneus

**N:** Navicular

**M:** Medial cuneiform

**I:** Intermediate cuneiform

**L:** Lateral cuneiform

**C:** Cuboid

They all contribute to the transverse and longitudinal arches of the foot and are also involved in short absorption.

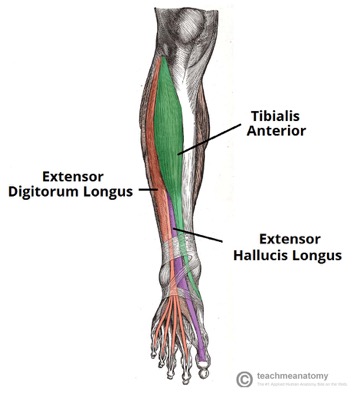
**ANTERIOR COMPARTMENT OF THE LEG**

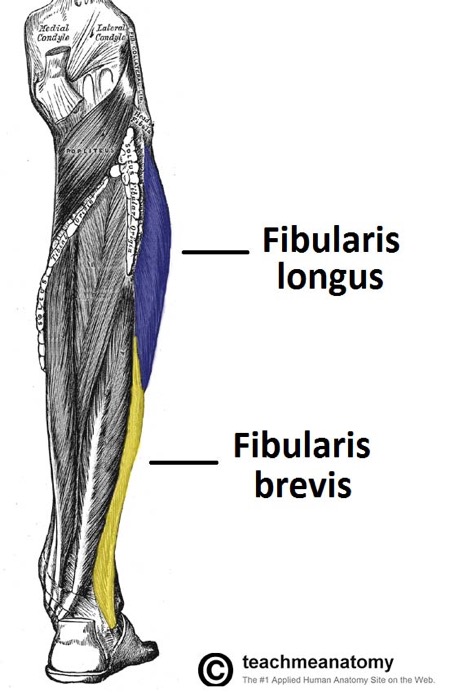
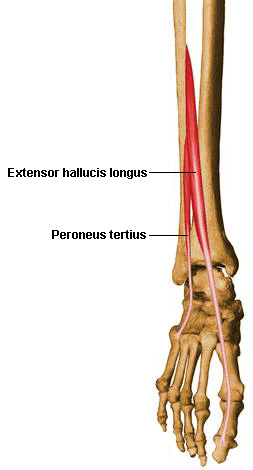
**Action:**

* Dorsi Flexion and Inversion of the foot at the ankle joint
* Extension of the toes

**Innervation:** Deep peroneal/fibular nerve

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Muscle** | **Origin** | **Insertion** | **Action** | **Innervation** |
| Tibialis anterior | Lateral surface of the tibia | Medial cuneiform | Dorsiflexion  Inversion | Deep peroneal nerve |
| Extensor digitorum longus  **\*there is also an extensor digitorum brevis**  **(lies lateral and deep to tibialis anterior)** | Lateral condyle of the tibia | Fibres converge into tendon, which travel to the dorsal surface of the foot. The tendon the splits into 4. | Extension of 4 lateral toes  Dorsiflexion |
| Extensor hallucis longus  **(located deep to both)** | Medial surface of the fibular shaft | Tendon crosses anterior to ankle joint and attaches to distal phalnx of great toe | Extension of great toe  Dorsiflexion |



**LATERAL COMPARTMENT OF LEG**

**Action**: Eversion

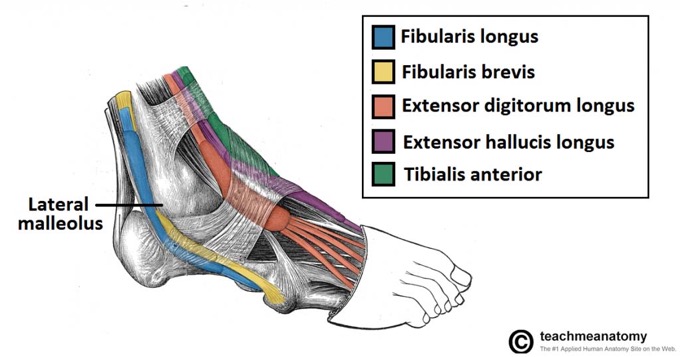
**Innervation**: Superficial peroneal/tibial nerve

**Origin**: lateral surface of fibular shaft

* Peroneus/Fibularis longus
* Peroneus/ Fibularis brevis
* Peroneus teritus

**Note:**

From the anatomical position, you can only do a few degrees of eversion. In reality, the job of these muscles is to fix the medial margin of the foot during running and preventing excessive inversion



The fibres converge into a tendon, which descends the foot POSTERIOR to the lateral malleolus.

The tendon then crosses under the foot and attaches to the bones on the medial side, namely the media cuneiform i.e. **attach to the plantar surface of the foot**

**POSTERIOR COMPARTMENT OF THE LEG**

**Action:**

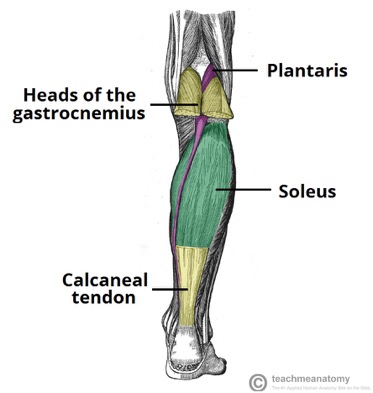
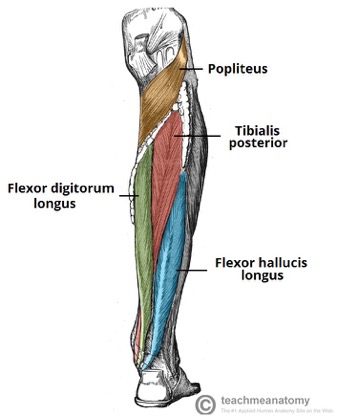
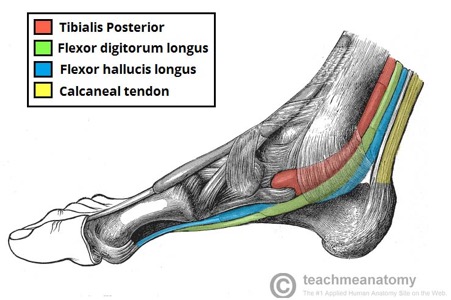
Plantar Flexion

Inversion

**Innveration:**

Tibial nerve (terminal branch of the sciatic nerve)

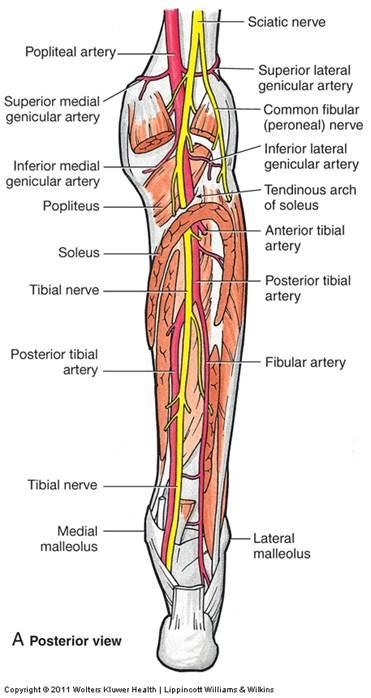
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Muscle** | **Origin** | **Insertion** | **Action** | **Nerve supply** |
| Superficial | | | | Tibial Nerve |
| Gastrocnemius  (medial and lateral head)   * **Most superficial** * **crosses the knee joint** | Lateral and Medial femoral condyle | Calcaneal tendon i.e.  Achilles tendon | Plantar flexion  Flexion at the knee |
| Plantaris | Lateral supracondylar line of the femur | Plantar flexion  Flexion at the knee |
| Soleus   * **Deepest of the 3** * **Crosses the knee joint** | Soleal line of the tibia and proximal fibular area | Plantar flexion |
| Deep | | | |
| Popliteus   * **Forms base of the popliteal fossa** | Posterior surface of proximal tibia | Lateral condyle of the femur | Laterally rotates femur on the tibia ‘unlocking’ the knee joint so flexion can occur |
| Flexor Digitorum Longus | Medial surface of tibia | Plantar surface of lateral four digits | Flexes four toes |
| Flexor Hallucis Longus | Posterior surface of the fibula | Plantar surface of the phalanx of the great toe | Flexes the great toe |
| Tibialis Posterior **(deepest)** | Interosseous membrane | Posterior to medial malleolus and attaches to plantar surface of the foot | \*plantar flexion  Inversion |



**Pictures above:**

Superficial and deep layers of the posterior aspect of the leg

Flexor digitorum longus and flexor hallucis longus inserting into the plantar surface of the foot.



**Mnemonic for posterior compartment of the leg**

[**T**all **D**octors **A**re **N**ever **H**ungry](http://yusriarif.tumblr.com/post/32323620291/tall-doctors-are-never-hungry)

Structures that pass behind medial malleolus deep to flexor retinaculum

(From anterior to posterior)

* ***T***ibialis posterior
* flexor ***D***igitorum longus
* posterior tibial ***A***rtery
* tibial ***N***erve
* flexor ***H***allucis longus tendon

**MUSCLES ON THE PLANTAR SURFACE OF THE FOOT**



**SESSION 8: JOINTS OF THE LOWER LIMB**

**THE HIP JOINT**

* Ball and socket synovial type joint between the head of the femur and the acetabulum of the pelvis
* Joint is a stable weight bearing one
* The head of the femur is hemispherical and fits completely into the concavity of the acetabulum
* Both the **head of the femur and acetabulum are covered in articular cartilage**

**Ligaments:**

* Act to increase stability
* Two main categories: Intracapsular and Extracapsular

**Intracapsular:**

* Ligament of head of femur

Runs from the acetabular fossa to the fovea of the femur

Encloses the obturator artery

**Extracapsular**

* Ilifemoral
* Pubofemoral
* Ischiofemoral

**Vascular Supply**: medial and lateral circumflex femoral arteries

**Stabalising Factors:**

The primary function of the hip joint is to bear weight. There are various structures present that increase its stability.

* **Acetabulum**

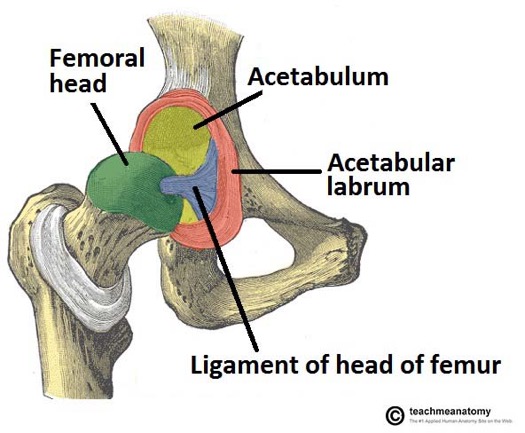
It encompasses nearly all of the head of the femur and this decreases the probability of the head slipping out of the acetabulum and causing a dislocation

* **Acetabular Labrum**

This is a fibrocartilaginous collar around the acetabulum which increases its depth and it provides a large articular surface therefore improving the stability of the joint.

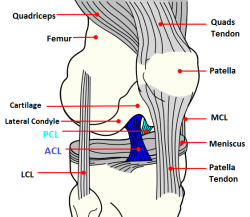
* **Ileofemoral, pubofemoral and ischiofemoral**

Strong ligaments and along with the thickened joint capsule. They stabalise the joint greatly.

**Movements and Muscles**

Movements that can be carried out at the hip joint:

* Flexion
* Extension
* Abduction
* Adduction
* Medial/lateral rotation

**THE KNEE JOINT**

**Actions:** Flexion and extension (small amount of lateral and medial rotation)

* Synovial joint
* Formed by articulations between patella, femur and tibia
* Shape of the knee joint means it is relatively weak and so relies on muscles and ligaments to ensure stability

**Articulating surfaces**

Two articulations:

Both are lined with hyaline cartilage and enclosed within a single join cavity

* **Tibiofemoral**

Medial and lateral condyles of the femur articulate with the tibia

- weight bearing joint

* **Patellofemoral**

Anterior and distal part of the femur articulating with the patella

- allows the tendon of quadratus femoris (main extensor of the kene) to be inserted directly over the knee

**Menisci**

* Medial and lateral misci which are **fibrocartilage structures** in the knee that serve to:
* Deepen the articular surface of the tibia therefore increasing stability of the joint
* Act as shock absorbers

**Ligaments:**

**Patellar ligament**

Continuation of the quadriceps femoris tendon distal to the patella

**Collateral ligaments**

Two strap life ligaments which act to stabalise the hinge motion of the knee preventing any medial or lateral movement

* Tibial (medial) collateral ligament
* Fibular (lateral) collateral ligament

**Cruciate ligaments**

Named by their attachments to the TIBIA

* **Anterior cruciate ligament**

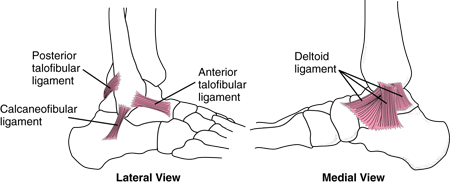
Prevents anterior dislocation of the tibia onto the femur

* **Posterior cruciate ligament**

Prevents posterior dislocation of the tibia onto the femur

**OTHER JOINTS OF THE LOWER LIMB**

**Interroseus membrane and inferior tibiofibular joints**: connect the tibia and fibula



**Ankle joint**

* deltoid ligament
* anterior and posterior talofibular ligament
* calcaneofibular ligament

All of the above are commonly damaged in a sprain ankle

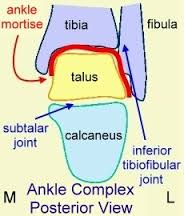


**The synovial joint between the lower ends of the tibia and fibula and the talus = ankle joint.**

* Plantar Flexion and Dorsiflexion take place at this joint. More specifically, it takes place at the tibiotalus joint

**Medial malleoli & Lateral malleoli:**

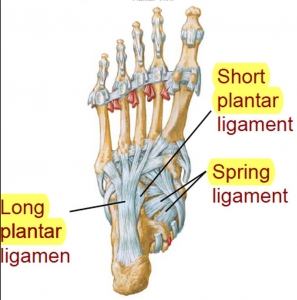
* Both act to stabalise the ankle joint



**Inferior tibiofibular joint:**

A fibrous joint

**Plantar surface of the foot**

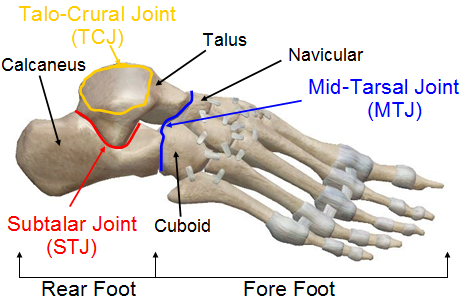
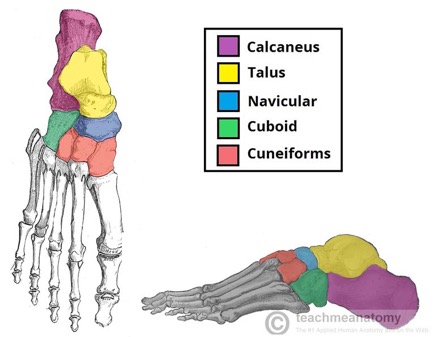


**Long plantar Ligament**

* Covers the surface of the calcaneum
* Attaches distally to the cuboid bone and the central three tendons

**Plantar calcaneonavicular (spring) ligament**

* Extends from the sustentaculum tail to the navicular bone.
* The head of the talus rests on its upper surface which forms part of the capsule of the **subtalar joint**

**Midtarsal joint**

Formed by the articulation between:

**Talus and the Navicular (MEDIAL)**

(Talonavicular joint)

**+**

**Calcaneus and cuboid bone (LATERAL)**

(calcaneocuboid joint)

\*Note: the medial component of the midtarsal joint shares the same synovial cavity with the subtalar joint

**Inversion and Eversion Movements**

**Inversion of the foot**

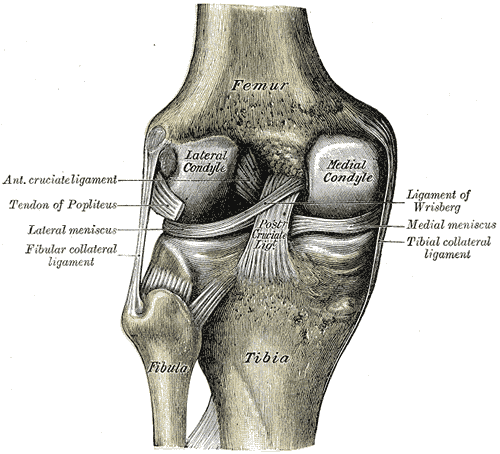
* Tibialis anterior and posterior
* Midtarsal joint aDducts

**Eversion of the foot**

* Peroneus longus and brevis
* Midtarsal joint aBducts

**When the foot is on the ground:**

* aDudction of the forefoot is masked by lateral rotation of the leg
* Eversion of the a fixed foot is accompanied by medial rotation of the leg

**SESSION 8: EXTRA NOTES**

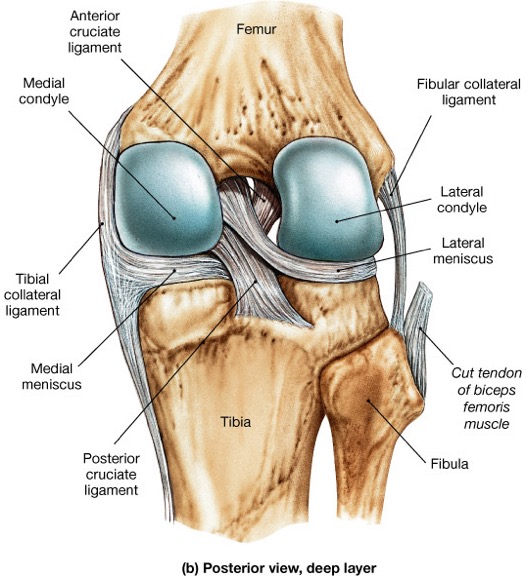
**Knee Joint**

Formed by articulations between the femoral condyles at the tibia.

The fibula DOES NOT articulate with the femoral condyle

Femoral condyles:

* **Medial is longer** anteriorly and posteriorly
* **Lateral** has more of a **rounded shape**

**Femur Tibial surfaces**

Femur 🡪 curved surface

Tibia 🡪 flat surface

* Contains a medial and lateral tibial plateau on which the lateral and medial meniscus lie

**Menicus**

* Lateral meniscus moves!!
* Medial meniscus does not move and therefore is more commonly damaged

**Primary and secondary articulations**

1o articulation

Lateral femoral condyles with the lateral tibial plateau

2o articulation

Medial femoral condyles with the medial tibial plateau

**Collateral ligaments**

Medial (tibia) collateral ligaments – it is part of capsule

Lateral (fibula) collateral ligaments – it is not part of the capsule

**Cruciate Ligaments**

Anterior cruciate ligament – from the front of the tibia to the back of the femur

\*damaged more commonly!

Posterior cruciate ligament – from the back of the tibia to the font of the femur