

## APPENDICULAR MUSCLES

### Muscles of the Arms and legs

When studying the arms and legs, it is important to remember the basic vocabulary that will appear many times. It is also valuable to refer to the skeletal system when learning the muscles' names.

1. Abduct= to take away (alien abduct you)
2. Adduct= to bring back
3. Depressor= to bring down (depressed)
4. Levator= to bring up (levitate)
5. Extend= to increase angle
6. Flex= to decrease angle
7. Pronate= to put face down
8. Supinate= to put face or palm up (hold a bowl of soup)
9. Brachi= relating to Branches (arms)
10. Origin= connection of muscle to a bone that is not affected by the contraction
11. Insertion= where muscle acts to move bone that moves with contraction.
12. Pennate= pen shaped
13. Labii= Lips
14. Ceps= head
15. Supra= above
16. Infra= below
17. Sub= under
18. Spinatus= having to do with a spine like projection.
19. Pollicis= thumb
20. Digit= phalanges
21. Oponens= apposes abduction
22. Longus= longest one
23. Brevis= shortest one (brief)
24. Hallucis= big toe

### Muscles of the pectoral girdle:

The area called the pectoral girdle is made up of the clavicle, scapula, and humerus. The Clavicle can be palpated from the sternum to the acromion of the Scapula on both a skeleton and volunteer. To aid in orientation, boundaries that make up triangles and visible depressions are vital.

Superficial Muscles of the back which move the arm or shoulder:

| Muscle           | Origin  | Insertion                   | Action   |
|------------------|---|-----------------------------|--|
| Trapezius        | Occipital bone, spinous processes of thoracic vertebrae | Clavicle and scapula        | Elevates, retracts, and depresses scapula  |
| Latissimus dorsi | Spinous process of Thoracic and lumbar vertebrae        | Greater tubercle of humerus | Extension, adduction, medial rotation of shoulder  |
| Deltoid          | Clavicle and scapula                                    | Deltoid tuberosity          | Abduction of shoulder<br><i>Anterior:</i> Flexion, medial rotation<br><i>Posterior:</i> Extension and lateral rotation |

1. On the image label structures from the table.

There are many triangles used in the clinical world which can help in orientation. One of the first is a small triangle made up of the Trapezius, with an origin of the occipital bone, the cervical region and ending at T12. Its insertion is from the scapula at its superior angle and spine to acromion end of the Clavicle (a triangle muscle which touches its counterpart at the spine making a trapezoid). The Trapezius value is not only in its actions, but it is one of the main muscles that stabilizes the scapula.

Inferior to the Trapezius and with an origin of thoracolumbar fascia and the Iliac crest then inserting in the intertubercular groove is the Latissimus dorsi. The last border of this triangle is the medial border of the scapula.

Ask your partner to rotate their arm medial then lateral while you are feeling Latissimus dorsi muscle.

2. When does this muscle contract?

The last superficial muscle of the posterior part of the shoulder is also seen on the anterior side. It originates includes the spine of the scapula following it to the clavicle. It inserts on the Deltoid tuberosity of the shaft on the humerus. This is your deltoid. Feel your partners and tell them to abduct their humerus then let it fall.

3. When did the Deltoid contract?



**Superficial Muscle on the anterior part of the Thorax acting on the shoulder:**

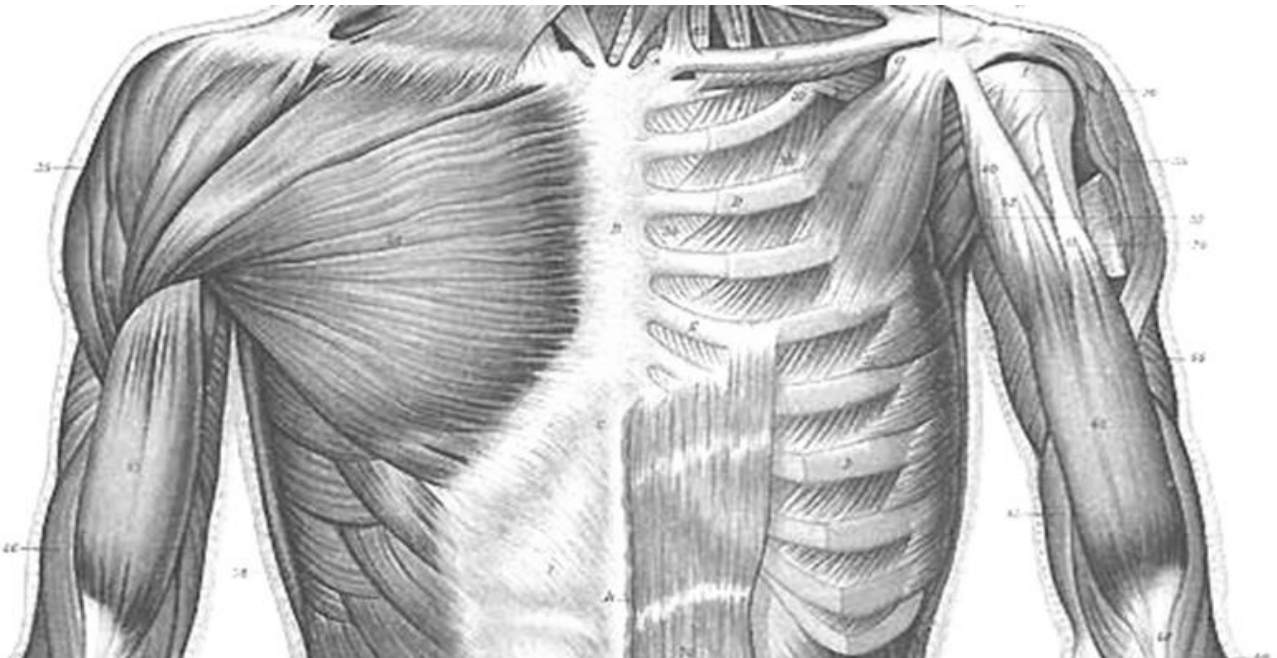
| Muscle            | Origin                               | Insertion                                | Action  |
|-------------------|--------------------------------------|--|---|
| Serratus Anterior | Anterior superior margin of ribs 1-9 | Anterior medial border of scapula        | Protracts shoulder, rotates scapula so glenoid cavity points up                   |
| Pectoralis major  | Ribs 2-6, sternum and clavicle       | Greater tubercle on intertubercle sulcus | Flexion, abduction, and medial rotation of shoulder                               |
| Pectoralis minor  | Ribs 3-6                             | Coracoid process of scapula              | Depresses, protracts shoulder, rotates scapula to point glenoid cavity inferiorly |
| Deltoid           | Clavicle and scapula                 | Deltoid tuberosity                       | See table previous page   |
| Subclavius        | First rib                            | Clavicle                                 | Depresses and protracts shoulder  |
| Coracobrachialis  | Coracoid process                     | Medial margin of humerus                 | Adduction and flexion of shoulder   |

In the superficial aspect of the chest, there are many visible structured to help orient yourself. Serratus Anterior is seen in many body builders and boxers and its serrated shape gives it its name. The Serratus Anterior originate at the anterior lateral portion of the ribs (1-8) and inserts on the Medial border of the scapula. The Serratus anterior is important as it is the second muscle that helps stabilize the scapula.

As we look at the Pectoralis minor has an origin of ribs 2-5 and insert on the coracoid process of the scapula. This will cause the scapula to flex. The Subclavian has its origin is costal cartilage of the first rib and inserts on the inferior groove of the clavicle. Superficial to the Pectoralis minor is the Pectoralis major. This again is a muscle easily seen in body builders. Sometimes, one can see a triangle between the pectoralis Major, deltoid and clavicle. This triangle is called the deltopectoral triangle. The last muscle that works on the arm is the Coracobrachialis has its origin on the Coracoid process of the scapula and inserts at the medial surface of the humerus.

It is easy to see that there is a depression around the armpit called the axilla. The posterior border, called the posterior fold, is the Latissimus Dorsi and Serratus Anterior, the anterior border or fold is made up of the pectoralis major and minor.

4. On the image, label the muscles from the table above.



**Deep muscles of the back which act of the shoulder:**

| Muscle           | Origin                  | Insertion                 | Action                                      |
|------------------|-------------------------|---------------------------|---|
| Levator Scapulae | Spinous process of C1-4 | Superior angle of scapula | Elevates scapula                            |
| Rhomboid Major   | Spinous process of T1-6 | Medial border of scapula  | Adducts and rotates glenoid cavity downward |
| Rhomboid Minor   | Spinous process C7-T1   | Medial border of scapula  | Adducts and rotates glenoid cavity downward |

5. On the image provided label the muscles from the previous table:

There are three muscles that insert on the medial border of the scapula. The first originates from the transverse process of the Cervical vertebrae 1-4. Which is called your levator scapulae

Inferior to that muscle are the Rhomboids (diamond shaped) a minor and a major. These originate from the area of C7-T1 and T2-T5 respectively.

Under the Rhomboid muscles, there is a serrated muscle called the Serratus posterior superior. While its function is mostly unknown, some people suggest that it might be used in aiding respiration.

**Rotator cuff muscles:**

There is a subdivision to the pectoral girdle muscles which are referred to as the rotator cuff muscles. These are four muscles that hold the humerus, and some are named for the location regarding the scapula its processes, all are on the posterior part of the thorax.

The first one is found just above the spine of the scapula within the Supraspinatus fossa. It is called the Supraspinatus muscle. As it is a small deep muscle, it can be neglected in gym exercises, especially when too much weight is used triggering the deltoid to do most of the work. The Supraspinatus muscle originates on the suprascapular fossa and inserts at the Greater tubercle of the humerus. While the muscle can abduct the humerus, it will also keep the glenohumeral joint from dislocation in an inferior direction.

The Infraspinatus muscle, as its name implies, it sits inferior to the spinous process. Its origin is the infraspinatus fossa, and it inserts at the greater tubercle. This leads it to help pull the humerus backwards and in adduction. While its location keeps the



glenohumeral joint from sliding forward.

In many ways, the Infraspinatus is assisted in supporting the rotator cuff by the Teres minor. The Teres Minor has its origin at the lateral border of the scapula and inserts at the greater tubercle. Its action is to laterally rotate and adduct the humerus.

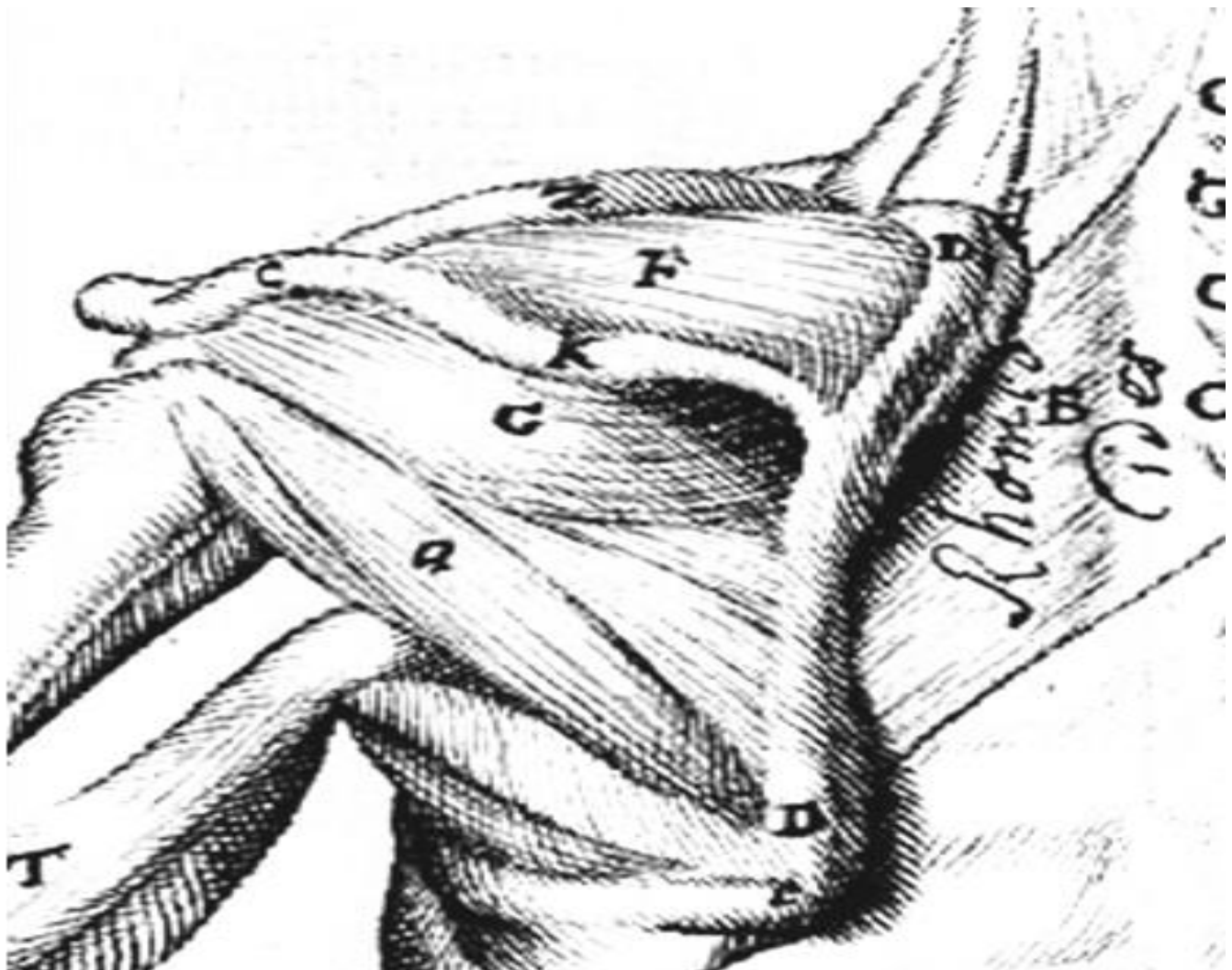
In the subscapular fossa, we find the last muscle which aids in supporting the rotator cuff. Its name is also based on the location, so the muscle is called the Subscapularis muscle. Its origin is the subscapular fossa, and it inserts in the lesser tubercle of the humerus. Its action is medial rotation of the shoulder, but it also keeps the glenohumeral joint from slipping backwards.

There is an acronym for these four muscles as they spell SITS. You will note that the t for Teres minor is small as it is the minor which is needed to support the rotator cuff. It is important to remember that the glenohumeral joint SITS within four muscles.

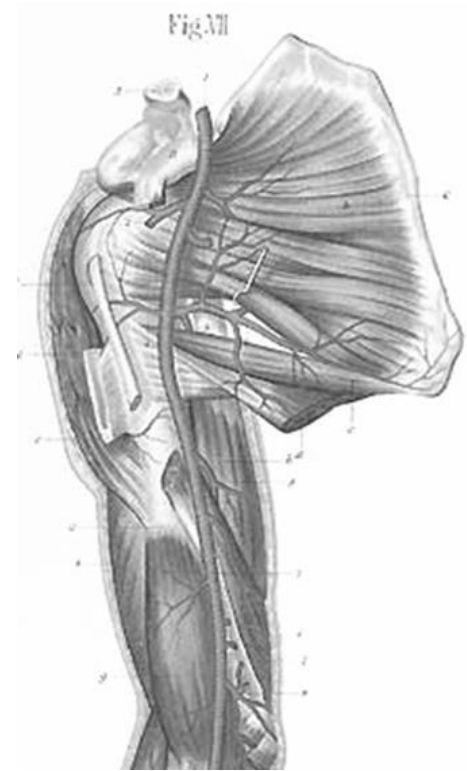
**Muscles of the Rotator Cuff**

| Muscle        | Origin                    | Insertion                   | Action                         |
|---------------|---------------------------|-----------------------------|--------------------------------|
| Supraspinatus | Supraspinatus fossa       | Greater tubercle of humerus | Abduct shoulder                |
| Infraspinatus | Infraspinatus fossa       | Greater tubercle of humerus | Lateral rotation of shoulder   |
| Teres minor   | Lateral border of scapula | Greater tubercle of humerus | Lateral rotation and adduction |
| Subscapularis | Subscapular fossa         | Lesser tubercle of humerus  | Medial rotation                |

6. Using the table above, label and color in the posterior muscles of the rotator cuff be?



7. What movements might each of the rotator muscles stabilize the glenohumeral joint against?
- Supraspinatus:
  - Infraspinatus
  - Teres minor
  - Subscapularis
8. On the picture provided label the subscapularis muscle



Other Deep posterior muscles that move the shoulder:

Inferior to the infraspinatus muscle with an origin of the posterior surface of the inferior scapular angle is the Teres Major, it attaches to the greater tubercle of the humerus. The Teres major aids in medial rotation of the humerus and extension of the shoulder.

9. Label the Teres Major in both pictures provided.

Muscles found on the anterior brachial region:

There are three muscles that work in synergy to flex the elbow. If a coronal plane is taken from the humerus, the muscles that flex the elbow are found in the anterior aspect of the arm. These are the biceps brachii, the brachialis, and the brachioradialis. Starting superficially, the Biceps brachii has two heads or origins. The short head is on the Coracoid process and the long head is on the supraglenoid tubercle.

### Superficial Muscles of the anterior aspect of the arm:

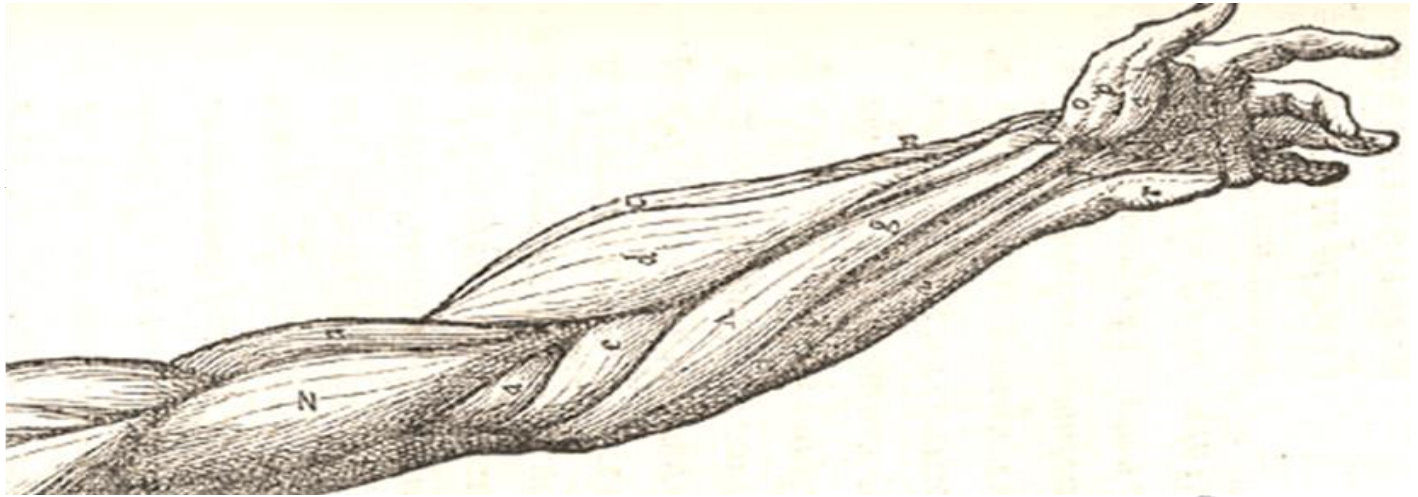
| Muscle                | Origin   | Insertion  | Action                         |
|-----------------------|--|--|--------------------------------|
| Biceps brachii        | Short head: coracoid process<br>Long head: supraglenoid tubercle | Radial tuberosity  | Elbow flexion and supination   |
| Brachialis            | Anterior distal end of humerus                                   | Ulnar tuberosity   | flexion                        |
| Brachioradialis       | Superior aspect of lateral epicondyle                            | Lateral aspect of styloid process of radius              | Flexion                        |
| Pronator teres        | Medial epicondyle and coronoid of ulna                           | Middle of lateral radial surface                         | Pronation and flexion          |
| Flexor carpi radialis | Medial epicondyle  | Base of 2 <sup>nd</sup> and 3 <sup>rd</sup> metacarpals  | Flexion and abduction at wrist |
| Palmaris longus       | Medial epicondyle  | Palmar aponeurosis                                       | Flexion of wrist               |
| Flexor carpi ulnaris  | Medial epicondyle  | Pisiform, hamate, and base of 5 <sup>th</sup> metacarpal | Flexion and adduction of wrist |

On the medial epicondyle, from what is known as the common flexor tendon, there are four muscles. One runs lateral to the radius and inserts at the lateral part of the midshaft of the radius. This is the Pronator Teres which will rotate the hand so that the palm is posterior. Immediately medial to the Pronator teres, running to the radius to insert at the base of the third metacarpal is the flexor carpi radialis. Medial from the Flexor carpi radialis is a muscle that

attaches to the fascia of the palm past the Transverse Carpal Ligament called the Palmaris longus. It is interesting that Palmaris brevis is within the TCL and is cut in Carpal Tunnel release. Medial to that is the flexor carpi ulnaris which runs from the common flexor tendon to the base of the 5<sup>th</sup> metacarpal.

A way to study the superficial muscles of the anterior aspect of the forearm is to place a thumb on the medial epicondyle and make the other four fingers point to the wrist. The index finger would be over the pronator teres, the middle finger should be over the flexor carpi radialis, the ring follows the palmaris longus, and the pinky should be close to the flexor carpi ulnaris.

10. On the images provided, label the muscles from the previous table:



It is easy to see an indentation in the anterior aspect of the elbow near where the forearm begins. This indentation is called the Antecubital fossa. You can press into your own fossa and feel the muscles that make the borders of it. On the medial border, you find the Pronator Teres while the brachioradialis is on the lateral border.

11. On the picture above, label the antecubital fossa.

Deep muscles of the anterior forearm:

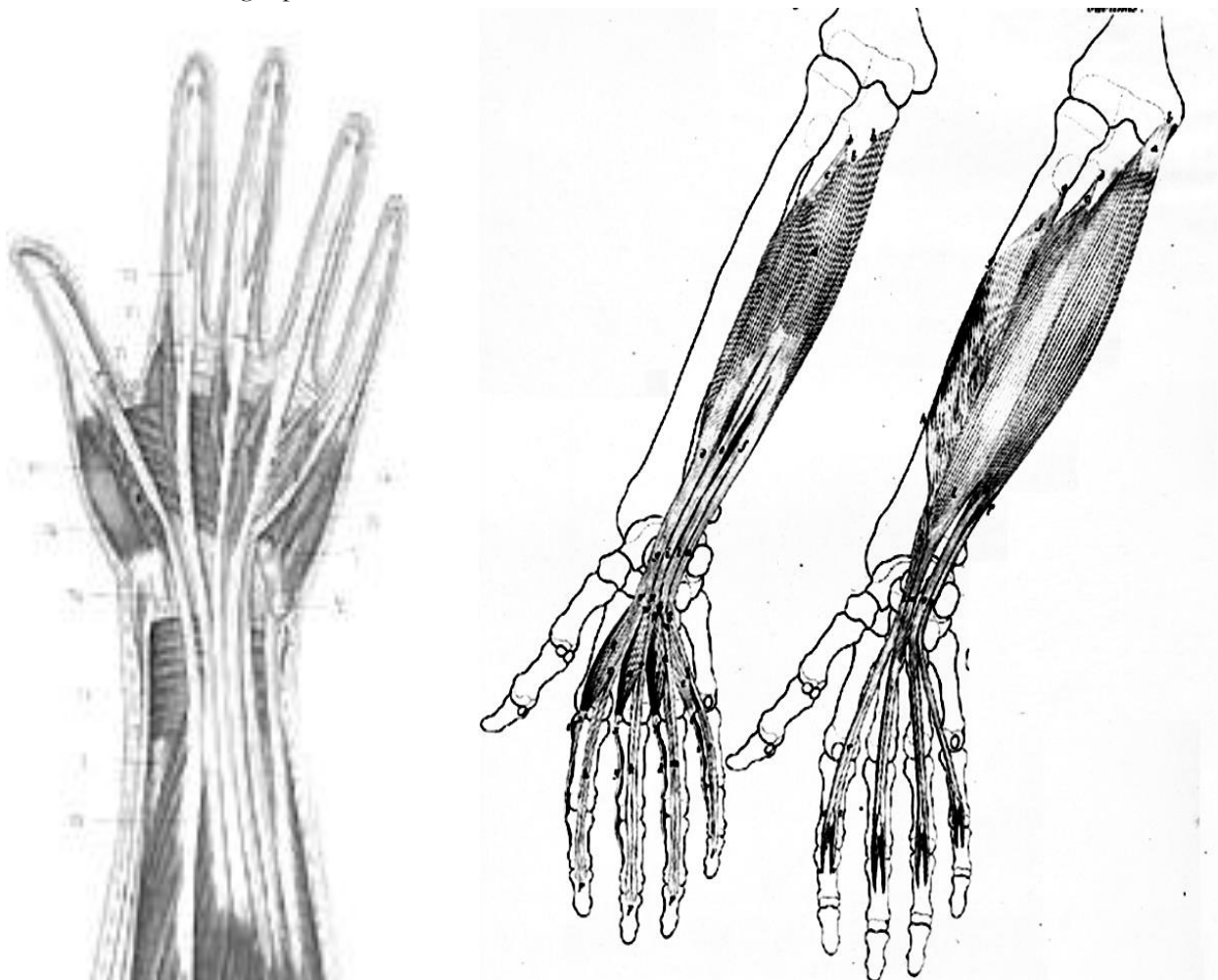
Just deep to the Pronator Teres, flexor carpi radialis, flexor carpi ulnaris, and Palmaris longus are the Flexor digitorum superficialis. It originates at the medial epicondyle and inserts at the middle phalanges. Deep to the Flexor Digitorum Superficialis are the Flexor digitorum profundus has its origin on the anterior medial surface of the ulna and inserts at the distal phalanges 2-5. There is a condition known as “trigger finger” where the normal smooth movement of the flexion of the finger is interrupted momentarily then the finger snaps to flexion. Lateral to Flexor Digitorum Superficialis is the flexor pollicis longus that originates at the lateral epicondyle of the humerus.

The eight tendons of the flexor digiti and the tendon of the flexor pollicis longus cross the carpals. The tendons are held in place by the Transverse Carpal Ligament, or Flexor Retinaculum. With the bones of the wrist, this ligament forms the carpal tunnel. The deepest muscle is square shaped and originates on the distal end of the ulna and inserts at the distal end of the Radius. It is your Pronator quadratus. On the lateral epicondyle you find the origin of the supinator muscle inserts on the proximal end of the radius.

**Deep anterior muscles of the forearm:**

| Muscle                         | Origin                    | Insertion                    | Action           |
|--------------------------------|---------------------------|------------------------------|------------------|
| Flexor digitorum superficialis | Medial epicondyle         | Base of middle phalanges 2-5 | Flexion          |
| Flexor digitorum profundus     | Medial surface of ulna    | Base of distal phalanges 2-5 | Flexion          |
| Flexor pollicis longus         | Anterior shaft of radius  | Base of distal phalanx 1     | Flexion of thumb |
| Pronator Quadratus             | Anteromedial surface ulna | Anterolateral surface radius | pronation        |

12. On the images provided label the muscles from the table above





13. Feel the anterior aspect of your forearm and make a fist then open it and open it again. When do these muscles contract?
14. Why does the arrangement of the flexor digitorum make them prone to “trigger finger”?

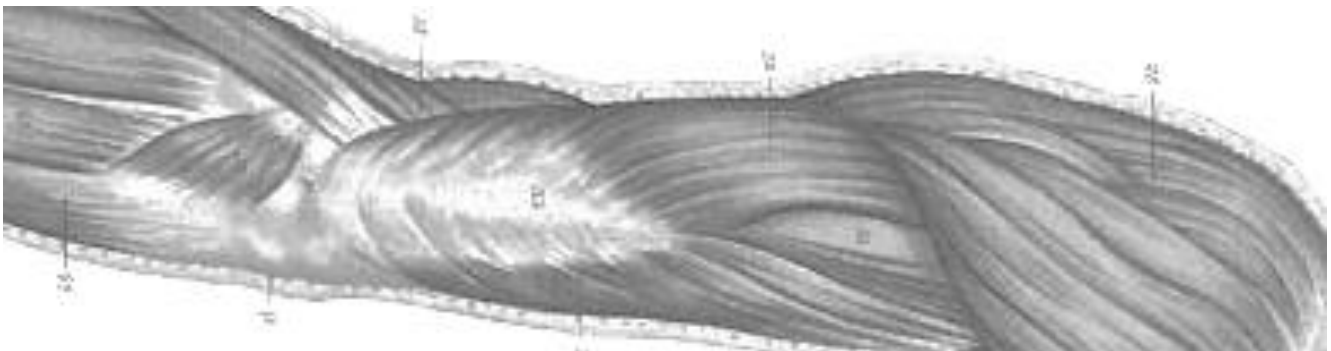
Superficial muscles of the posterior aspect of the arm:

The posterior aspect of the arm, the extensors of the elbow. These include the anconeus and the triceps brachii. As the triceps brachii is so large, many people miss the Anconeus. Tri means three and ceps means heads, it means that the Triceps brachii has three origins. The long head (longest one) is in the infraglenoid tubercle, lateral most is the lateral head on the lateral side of the humerus and the medial head is inferior to the radial groove, on the medial side of the humerus. The little anconeus originates from the lateral epicondyle. Both muscles insert onto the Olecranon.

#### Muscles of the posterior aspect of arm:

| Muscle  | Origin   | Insertion                 | Action    |
|---|--|---------------------------|-----------|
| Triceps<br>Long head<br>Lateral head<br>Medial head | Infraglenoid tubercle of scapula<br>Superior lateral margin of humerus<br>Inferior to Radial groove of humerus | Olecranon process         | Extension |
| Anconeus  | Posterior of lateral epicondyle of the humerus   | Olecranon and ulnar shaft | Extension |

15. On the image provided, label the Triceps Brachii and Anconeus.

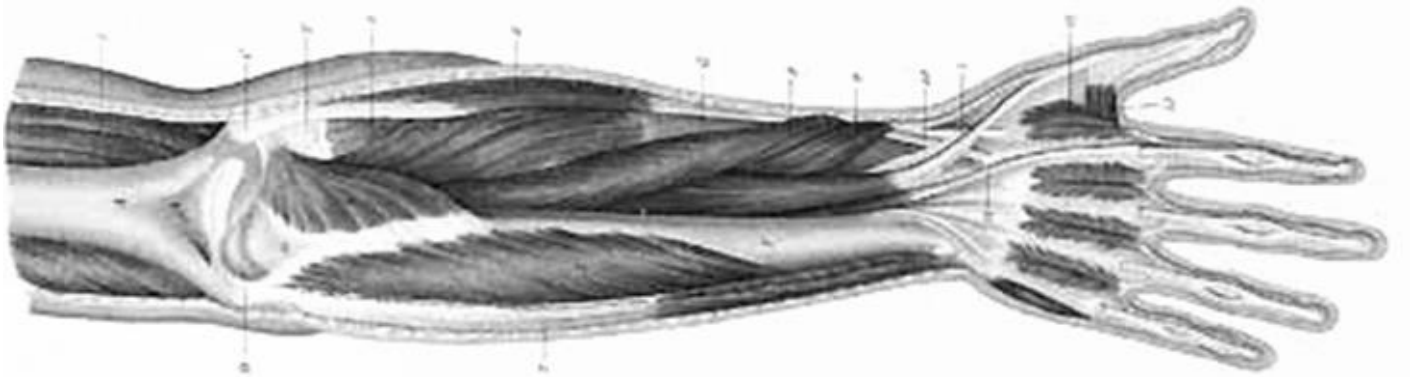


#### Muscles of the posterior aspect of the forearm

| Muscle                                      | Origin  | Insertion  | Action                  |
|---|---|--|-------------------------|
| Extensor carpi radialis<br>Longus<br>Brevis | Lateral supracondylar ridge<br>Lateral epicondyle | Base of 2 <sup>nd</sup> metacarpal<br>Base of 3 <sup>rd</sup> metacarpal | Extension and abduction |
| Extensor carpi ulnaris                      | Lateral epicondyle                                | Base of 5 <sup>th</sup> metacarpal                                       | Extension and adduction |
| Extensor digitorum                          | Lateral epicondyle                                | Base of distal phalanx 2-5   | Extension               |
| Supinator                                   | Lateral epicondyle                                | Anterolateral radius   | Supination              |
| Extensor digiti minimi                      | Lateral epicondyle                                | Proximal phalanx 5 <sup>th</sup> digit                                   | Extension               |
| Extensor indicis                            | Posterior surface of ulna                         | Proximal phalanx 2 <sup>nd</sup> digit                                   | Extension               |
| Extensor pollicis Longus<br>“ “ Brevis      | Posterior lateral ulna<br>Shaft distal radius     | Base of distal phalanx 1<br>Base proximal phalanx 1                      | Extends thumb           |
| Abductor pollicis longus                    | Proximal posterior of ulna and radius             | 1 <sup>st</sup> metacarpal   | Abduction of thumb      |

Muscles of the posterior forearm are named by action and insertion and anatomical sites. Most of the posterior muscles will originate at the lateral epicondyle except for those muscles that extend the small finger and thumb. When dealing with the fingers, we have names for each, the first digit is the pollicis while the index is the indices and little finger is minimi. Besides the extensors, there are two muscles that abduct the thumb called the abductor pollicis longus and brevis. The tendons of the abductor pollicis muscles form an important anatomical landmark called the Anatomical Snuff box. This is the area where the Scaphoid bone can be found and if someone has severe pain in this area, it is probable that they have a scaphoid fracture even if it does not appear to be broken in X-ray.

16. On the images, label the muscles from the table of the posterior forearm (previous table)



17. Label the anatomical snuff box in the picture above.

Muscles of hand are the interossei either dorsal or palmar but note the names of the thenar and hypothenar muscles as well. In those areas you have muscles which work on exclusively on the thumb and smallest digit. This is why grip strength significantly decreases when the fingers on the ulnar side are excluded. In the muscles of the hand we see that any muscle with the word Pollicis in its name is related to the thumb while minimi is the smallest digit.

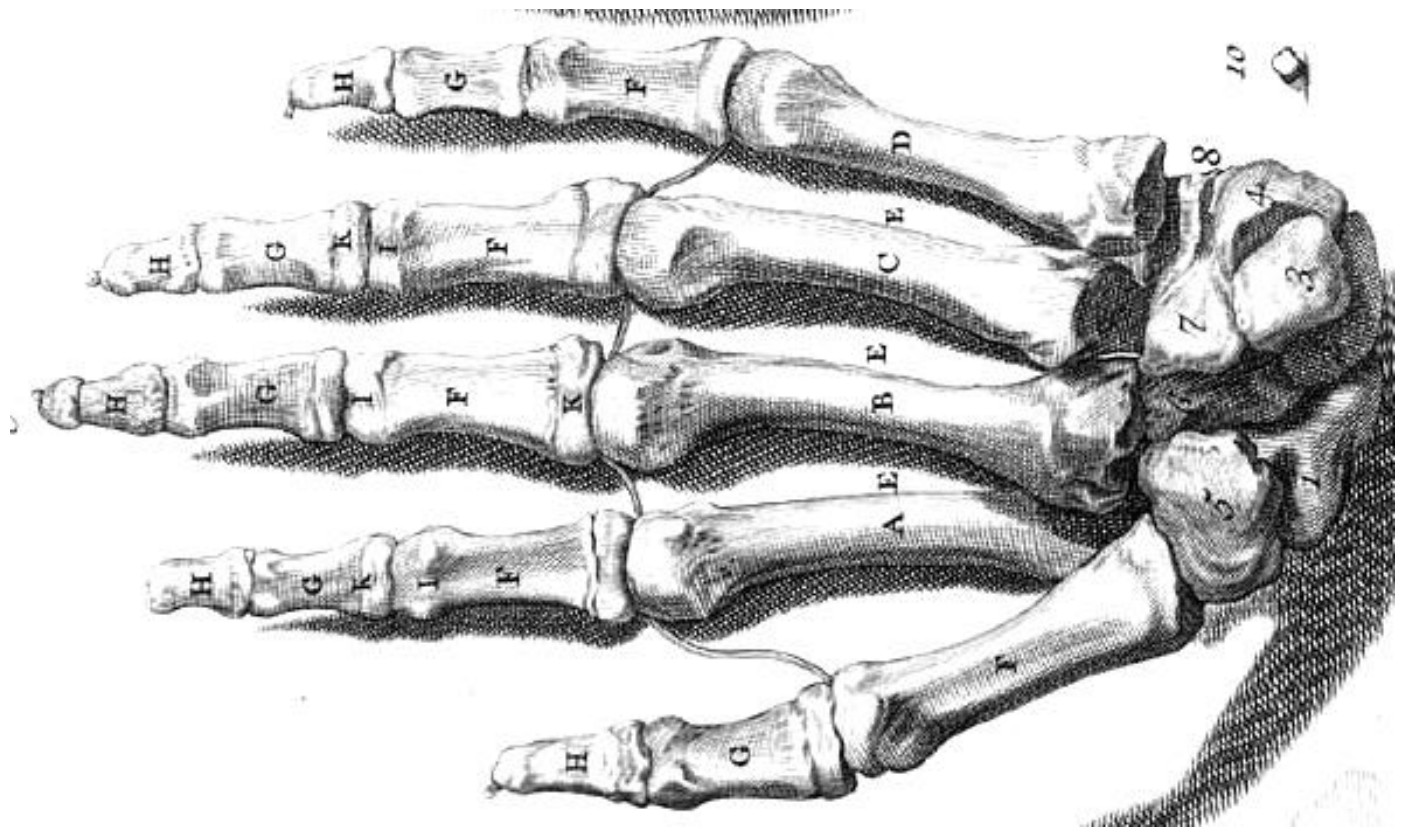
**Muscles of the Thenar Eminence:**

| Muscle                   | Origin  | Insertion                              | Action                           |
|--------------------------|---|--|----------------------------------|
| Abductor pollicis brevis | Scaphoid, trapezium, Transverse carpal ligament | Proximal phalanx 1 <sup>st</sup> digit | Abduction                        |
| Flexor pollicis brevis   | Trapezium, capitate, 1 <sup>st</sup> metacarpal | Proximal phalanx 1 <sup>st</sup> digit | Flexion                          |
| Adductor pollicis        | Metacarpal and carpals                          | Proximal phalanx 1 <sup>st</sup> digit | Adduction                        |
| Opponens pollicis        | Trapezium and transverse carpal ligament        | Proximal phalanx 1 <sup>st</sup> digit | Flexion of carpometacarpal joint |

**Muscles of the Hypothenar:**

| Muscle                      | Origin     | Insertion                              | Action                           |
|-----------------------------|------------|--|----------------------------------|
| Abductor digiti minimi      | Pisiformis | Proximal phalanx 5 <sup>st</sup> digit | Abduction                        |
| Flexor digiti minimi brevis | Hamate     | Proximal phalanx 5 <sup>st</sup> digit | Flexion 5 <sup>th</sup> digit    |
| Opponens digiti minimi      | Hamate     | Proximal phalanx 5 <sup>st</sup> digit | Flexion of carpometacarpal joint |

18. Using the two tables, draw and label the muscles of the Thenar and Hypothenar Eminences on the images provided.



Muscles of the Anterior aspect of the thigh:

Between the anterior spine of the ileum and the pubic tubercle runs a ligament known as the inguinal ligament. There is an important triangle that uses this as a border called the femoral triangle. Its borders also include the Sartorius and adductor longus. The superior border of the femoral triangle is the inguinal ligament. As you look at the inguinal ligament you will find a canal leading from the abdominal area to the femoral triangle. This is an area, when under increased intra-abdominal pressure, part of the intestine can herniate out of here. This is what is called a femoral hernia.

Inside the femoral triangle there are two muscles, the iliopsoas which is composed of the iliacus and Psoas major and the Pectineus. Medial to this triangle we can see the Gracialis muscle. Inferior and lateral to the femoral triangle we can find the quadriceps group.

As Quatri means four and ceps is head, the Quadriceps is composed of four heads and one insertion. The four muscles that make up the quadriceps femoris are the Rectus Femoris, which runs straight from the Anterior Superior Iliac Spine (ASIS) to the Tibial tuberosity. The other three muscles form a V-shape which are called the Vastus for vast or huge. These three muscles are Vastus lateralis, is lateral to the Rectus Femoris, Vastus medialis, medial to the Rectus femoris, and Vastus intermedius just under the Rectus femoris. Lateral to the quadriceps group we can find the Tensor Fasciae Latae which is part of the Gluteal group.

Under the Pectineus muscle within the Femoral triangle, one can find other important muscles. One of these is the Adductor brevis. Also deep to the adductor longus, one can see the Obturator externus which originates at the border of the Obturator foramen and inserts at the trochanteric fossa. Lateral to the Gracialis and posterior to the adductor longus and brevis is the Adductor magnus.

**Muscles seen in the anterior aspect of thigh:**

| Muscle              | Origin                                    | Insertion                               | Action  |
|---------------------|---|---|---|
| Adductor longus     | Inferior ramus of pubis                   | Linea aspera                            | Adduction, flexion and medial rotation                          |
| Sartorius           | ASIS                                      | Medial surface of tibia                 | Flexion of knee and hip, abduction, and lateral rotation of hip |
| Iliopsoas           | Iliac fossa and T12-L5 transverse process | Lesser trochanter                       | Flexion of hip and lumbar joints                                |
| Pectineus           | Superior ramus of pubis                   | Pectineal line of femur                 | Adduction and flexion   |
| Adductor magnus     | Inferior ramus of pubis                   | Linea aspera and adductor tubercle      | Adduction, flexion, extension and medial rotation of hip        |
| Gracialis           | Inferior ramus of pubis                   | Medial surface of tibial condyle        | Flexion and medial rotation of knee and hip, adduction of hip   |
| Tensor fascia latae | Iliac crest                               | Iliotibial tract                        | Abduction, medial rotation of hip and knee, extension of knee   |
| Rectus femoris      | ASIS and Superior acetabular ring         | Tibial tuberosity via quadriceps tendon | Extension of knee, flexion of hip                               |
| Vastus lateralis    | Anteroinferior to greater trochanter      | Tibial tuberosity via quadriceps tendon | Extension of knee, flexion of hip                               |
| Vastus Medialis     | Linea aspera                              | Tibial tuberosity via quadriceps tendon | Extension of knee, flexion of hip                               |
| Vastus intermedius  | Linea aspera                              | Tibial tuberosity via quadriceps tendon | Extension of knee, flexion of hip                               |

19. Label the muscles from the table above found on the image.

20. Draw the borders of the femoral triangle

**Posterior muscles of the thigh:**

On the posterior aspect of the leg, you can feel the iliac crest which is the hip bone. In that area you find the large gluteal muscles which make up the gluteal region. The largest of the Gluteal muscles is the gluteus maximus. Deep to the Gluteus Maximus are the Gluteus medius and minimus which is deep to the medius.

With the Gluteus maximus removed, many other muscles become visible in that region. Just inferior to the Gluteus Medius, are the Piriformis, then the Superior Gemellus, the Obturator internus, inferior gemellus and the Quadratus femoris. One Acronym which students have told me they have used to memorize the location of the deep muscles has been GPS OIQ ( GPS zerO IQ) so moving superior to inferior we have **G**luteus Medius, **P**iriformis, **S**uperior Gemellus, **O**bturator internus, **I**nferior Gemellus and **Q**uadratus Femoris.

As the Sciatic nerve passes between the Piriformis muscle and the Superior Gemellus it can sometimes be compressed by the muscles leading to the symptoms of sciatica. This is called “Piriformis syndrome” and is usually a result of activities which cause the muscle to enlarge. The treatment is usually rest and ice, but many other treatments seem to work.

21. If you are told to give an injection IM (intramuscular) and feel the iliac crest and go posterior by 1/3 and inferior by the same distance, what muscle are you injecting?



**Muscles of the Gluteal area:**

| Muscle            | Origin   | Insertion                               | Action  |
|-------------------|--|---|---|
| Gluteus Maximus   | Iliac crest, posterior gluteal line, sacrum and coccyx | Iliotibial tract and gluteal tuberosity | Extension, lateral rotation, abduction of hip |
| Gluteus Medius    | Iliac crest and middle gluteal line                    | Greater trochanter                      | Abducts and medial rotation of hip            |
| Gluteus minimus   | Above inferior gluteal line                            | Greater trochanter                      | Abducts and medial rotation of hip            |
| Piriformis        | Anteriolateral surface of sacrum                       | Greater trochanter                      | Lateral rotation and abduction of hip         |
| Superior Gemellus | Ischial spine  | Greater trochanter                      | As above                                      |
| Obturator interus | Borders of obturator foramen                           | Greater trochanter                      | As above                                      |
| Inferior Gemellus | Ischial tuberosity                                     | Greater trochanter                      | As above                                      |
| Quadratus femoris | Lateral border of ischial tuberosity                   | Intertrochanteric crest                 | Lateral rotation of hip                       |

22. Label the muscles from the table above on the image provided:



**Hamstrings muscle group:**

| Muscle          | Origin                              | Insertion                               | Action                            |
|-----------------|-------------------------------------|---|-----------------------------------|
| Biceps Femoris  | Ischial tuberosity and linea aspera | Head of fibula lateral condyle of tibia | Flex knee lateral rotation of hip |
| Semimembranosus | Ischial tuberosity                  | Medial condyle of tibia                 | Flex knee, medial rotation of hip |
| Semitendinosus  | Ischial tuberosity                  | Medial surface of tibia                 | As above                          |

The hamstrings group is formed from most muscles the flex the knee. Many of these muscles begin in the gluteal region and work down the knee. They form the superior borders of the popliteal fossa. While not part of the hamstrings group, there is one other muscle that flexes the knee. It is found on the distal end of the femur, with its origin at the lateral condyle of the femur and the insertion being the posterior surface of the Tibial shaft is the popliteus muscle.

One muscle which can be seen on the posterior aspect of the thigh is the Adductor magnus. It is located medial to the semitendinosus, superior to the semimembranosus and inferior to the Gluteus Maximus. Its origin is the inferior ramus of pubis, and it inserts at the linea aspera and adductor tubercle. As its name implies its major action is adduction but it also aids in flexion, extension, and medial rotation of hip.

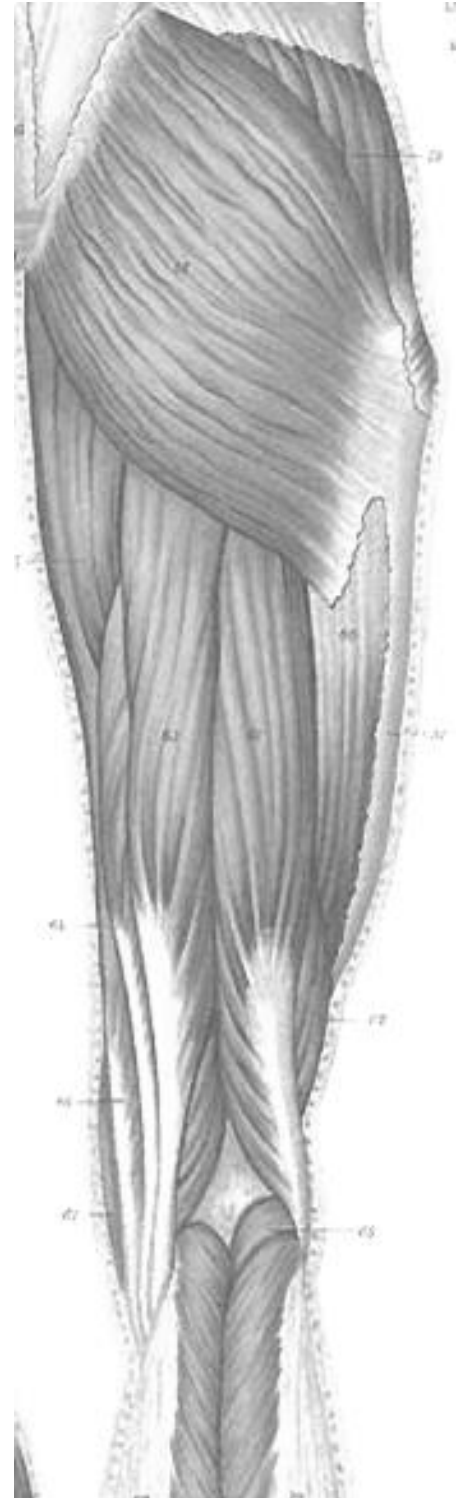
23. Label the muscles from table above:
24. Label the Adductor Magnus
25. Draw the borders of the Popliteal fossa.

From the hamstrings muscle group, there are things you can do to palpate on your body. At the superior lateral aspect of the popliteal fossa is the biceps femoris which can be followed as it runs up the femur. You can also feel the superior medial border of the popliteal fossa with a bent knee and put pressure so to extend the knee. This will lead to the tendon of the semitendinosus to become tight and palpable.

26. Which muscle forms the superior lateral border of the popliteal fossa?
27. Which muscle forms the Superior medial border of the popliteal fossa?
28. On the image provided label the plantaris and Gastrocnemius muscles.

**Posterior inferior aspect of the leg**

Passing the popliteal fossa, we find many muscles which plantar or dorsi flex the foot and toes. The most visible of these muscles is the Gastrocnemius which means stomach in Greek. It is the inferior medial border of the popliteal fossa. Lateral and superior to the gastrocnemius, we can find a small muscle named the Plantaris muscle. Together, the Gastrocnemius and Plantaris make the inferior border of the of the popliteal fossa.

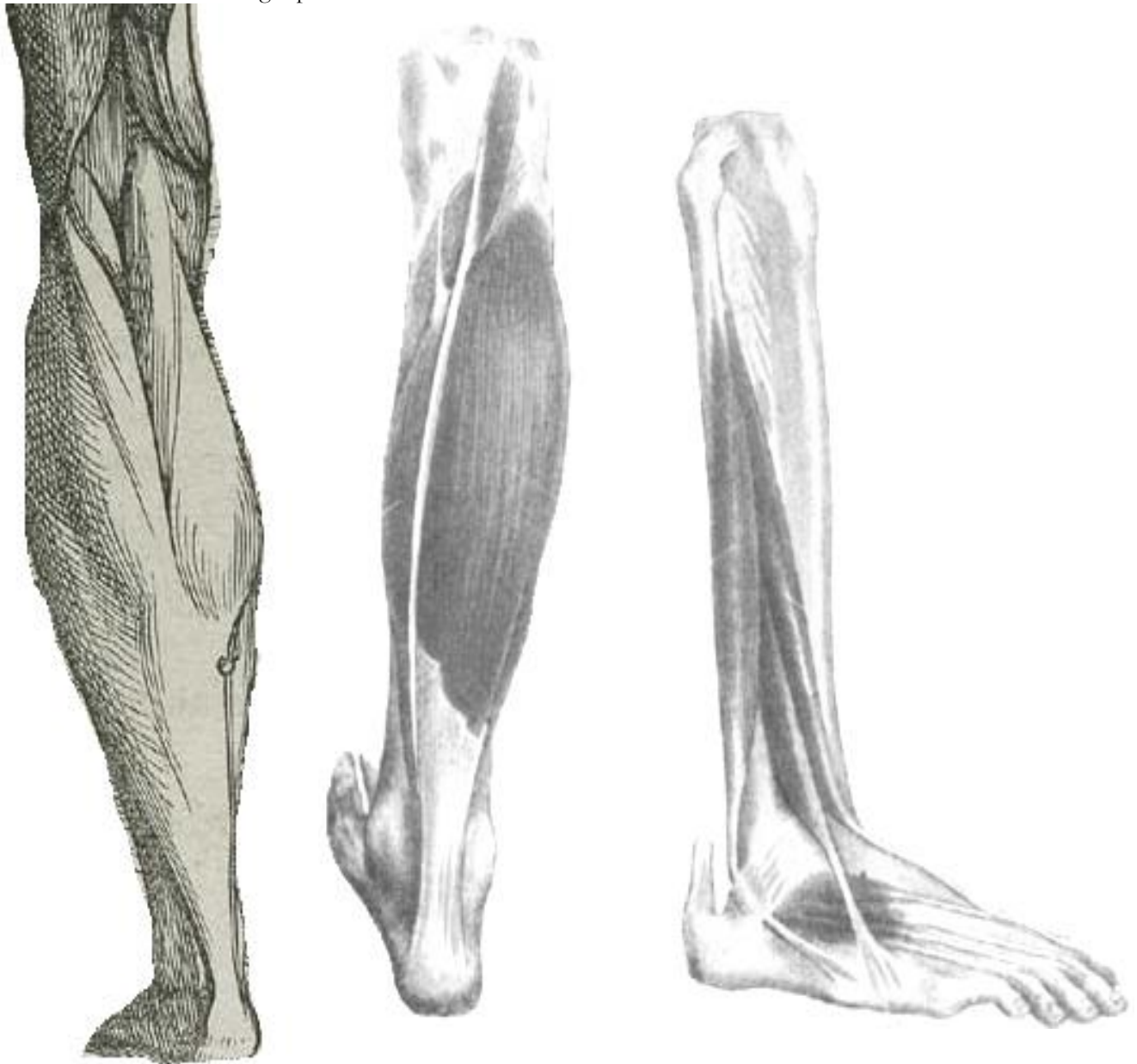


It is important to note that many of the muscles of the posterior aspect of the lower leg aid in stability of walking. This is important in understanding as weakness or overuse of certain muscles can lead to injury.

**Plantar flexors superficial:**

| Muscle           | Origin                                | Insertion  | Action                               |
|------------------|---------------------------------------|--|--------------------------------------|
| Gastrocnemius    | Femoral condyles                      | Calcaneus via ligament                           | Plantar flexion and flex knee        |
| Soleus           | Head of fibula, medial shaft of tibia | Calcaneus via ligament                           | Plantar flexion                      |
| Plantaris        | Lateral supracondylar ridge           | Calcaneus  | Plantar and knee flexion             |
| Fibularis longus | Head and shaft of fibula              | Medial cuneiforms and 1 <sup>st</sup> metatarsal | Eversion of foot and plantar flexion |
| Fibularis brevis | Mid-lateral margin of fibula          | 5 <sup>th</sup> metatarsal                       | Eversion and plantar flexion         |

29. On the images provided label the muscles in the table above:



**Deep muscles of the inferior posterior aspect of the leg:**

| Muscle                  | Origin                | Insertion                                  | Action                        |
|-------------------------|-----------------------|--|-------------------------------|
| Tibialis posterior      | Interosseous membrane | Navicular, cuneiforms, and 2-4 metatarsals | Inversion and plantar flexion |
| Flexor digitorum longus | Posteromedial tibia   | Distal phalanx 2-5                         | Flexion of toes               |
| Flexor hallucis longus  | Posterior fibula      | Distal phalanx 1 toe                       | Flexion of big toe            |

30. Label the muscles from the table above on the picture provided:
31. Label the fibularis longus and brevis
32. Label the popliteus muscle
33. What does the word hallicis refer to?
34. What does Digitorum tell you?

When dealing with the deep muscles of the posterior aspect of the lower leg, one finds certain names which tell you how the muscle will function as well as on which part of the foot. This tends to be seen in all anatomical names. It becomes apparent that a Flexor will flex, an adductor will adduct, and an abductor will abduct.

**Anterior aspect of the lower leg:**

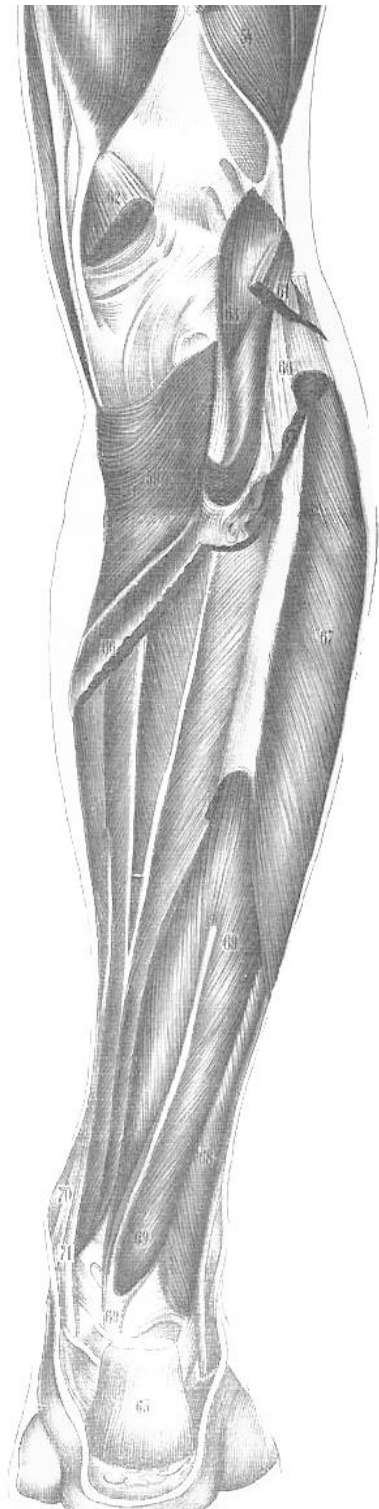
When one is looking at the anterior aspect of the lower leg, one finds that most of the muscles located there will have the function of extension or dorsi flexion of the foot. Just like the posterior aspect, there are names which tell you how a muscle will act.

35. What would an extensor do?
36. What does Longus tell you about a muscle?

The anterior aspect of the lower leg is the Tibialis anterior. This muscle is an antagonist to the Tibialis posterior discussed earlier. Looking at the Tibialis Anterior we find that its origin is the lateral condyle and proximal shaft of tibia and inserts at the base of the first metacarpal and the medial cuneiform bone. This will give it the action of dorsiflexion and will aid in inversion of the foot.

Lateral to the Tibialis Anterior is the extensor hallucis longus followed by the Extensor Digitorum longus. The Extensor Hallucis longus has its origin at anterior surface of the fibula and inserts, as its name implies, at the distal phalanx of the 1<sup>st</sup> toe. Again, as it is called the Extensor Hallucis, it causes extension of the big toe. This is aided by a smaller muscle which originates at the calcaneus called the Extensor hallucis brevis.

The last muscle of this group is the Extensor digitorum longus which originates at the anterior surface of the fibula and the lateral condyle of the tibia and inserts at the phalanx of toes 2-5 to cause extension. This is aided by the extensor digitorum brevis.





With the information provided, fill out the following table:

| Muscle                    | Origin    | Insertion          | Action |
|---------------------------|-----------|--------------------|--------|
| Tibialis anterior         |           |                    |        |
| Extensor digitorum longus |           |                    |        |
| Extensor digitorum brevis | Calcaneus | Middle phalanx 2-5 |        |
| Extensor hallucis longus  |           |                    |        |
| Extensor hallucis brevis  | Calcaneus | Proximal phalanx 1 |        |

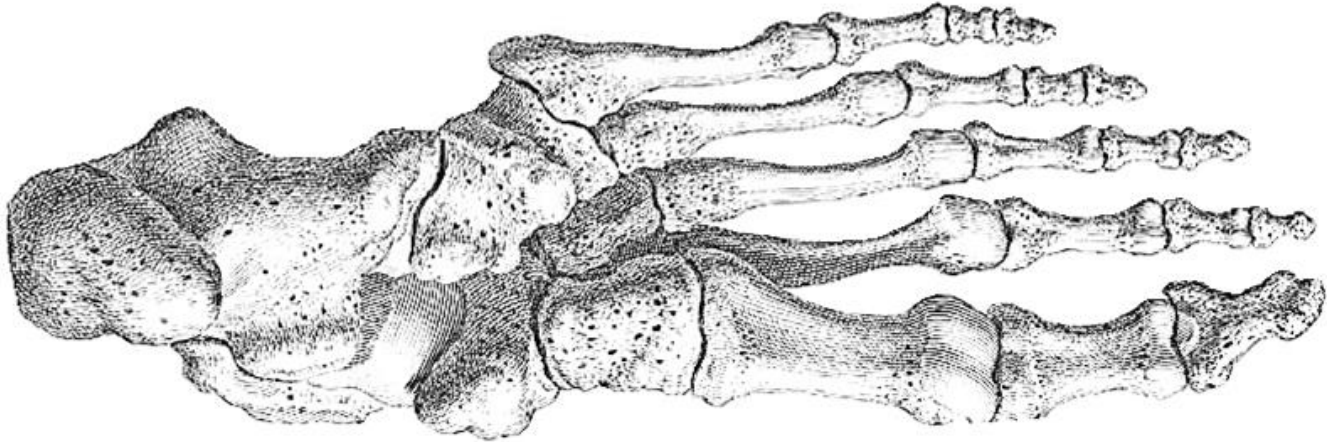
37. On the images label the muscles from the table above:



**Superficial Muscles of the plantar section of the foot:**

| Muscle                      | Origin                             | Insertion                        | Action                                    |
|-----------------------------|------------------------------------|----------------------------------|---|
| Flexor hallucis brevis      | Cuboid and lateral cuneiform       | 1 <sup>st</sup> Proximal phalanx | Flexes 1 <sup>st</sup> MTP joint          |
| Abductor hallucis           | Calcaneus                          | 1 <sup>st</sup> proximal phalanx | Adduction at MTP joint                    |
| Flexor digitorum brevis     | Cuboid and lateral cuneiform       | 2-5 <sup>th</sup> middle phalanx | Flexes PIP joint 2-5                      |
| Abductor digiti minimi      | Calcaneus                          | 5 <sup>th</sup> proximal phalanx | Abduct and flex 5 <sup>th</sup> MIP joint |
| Flexor digiti minimi brevis | Base of 5 <sup>th</sup> metatarsal | 5 <sup>th</sup> proximal phalanx | Flex 5 <sup>th</sup> MIP joint            |

38. Draw in and label the muscles of the table above:

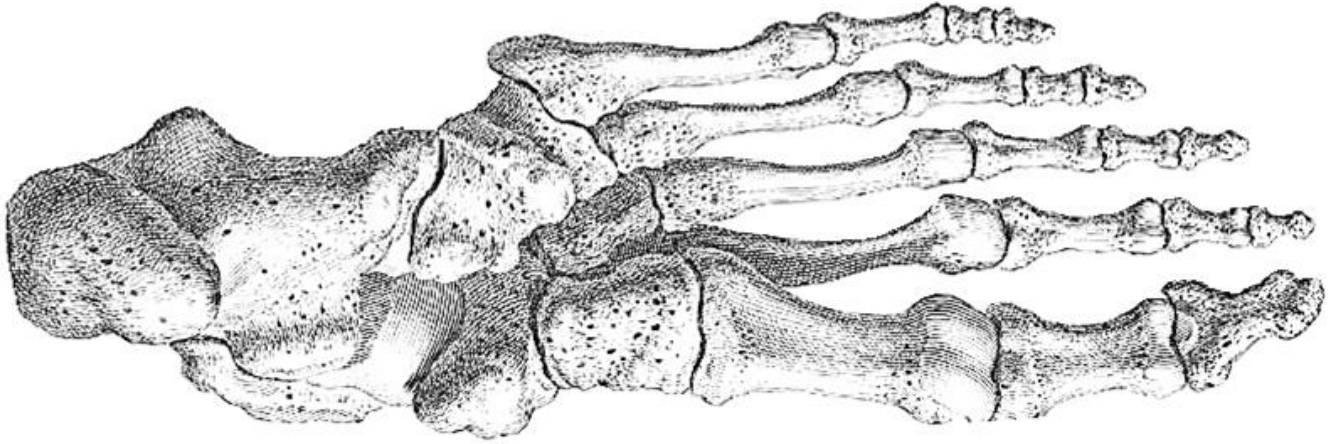


It is easy to see that most muscles of the foot are on the plantar side. In many ways this arrangement is identical to the hand. These muscles are also layered with the most superficial layers covering the deeper layers in a way which makes it hard to see all the muscles of the foot at once. It is simple to see that most of these muscles are used in either flexion, adduction, abduction or similar movements.

**Intermediate muscles of the foot:**

| Muscle                      | Origin                            | Insertion                            | Action                                    |
|-----------------------------|-----------------------------------|--------------------------------------|---|
| Quadratus plantae           | Calcaneus                         | Tendon of flexor digitorum longus    | Flection of toes 2-5                      |
| Flexor hallucis brevis      | Cuboid and lateral cuneiforms     | Proximal phalanx 1 <sup>st</sup> toe | Flexion of 1 <sup>st</sup> MTP joint      |
| Lumbricals                  | Tendon of flexor digitorum longus | Distal phalanx 2-5                   | Flex MTP joint and extension of IP joints |
| Flexor digiti minimi brevis | Metatarsal 5                      | Proximal phalanx 5                   | Flex 5 <sup>th</sup> MTP joint            |

39. Draw and label the muscles from the table above on the image provided below:



Deep muscles of the foot:

| Muscle               | Origin                  | Insertion                        | Action   |
|----------------------|-------------------------|----------------------------------|--|
| Adductor hallucis    | Base of metatarsals 2-5 | 1 <sup>st</sup> Proximal phalanx | Flexion of MTP joint of 1 <sup>st</sup> digit  |
| Plantar interosseous | Base of metatarsals     | Medial sides of toes             | Abduction, flexion and extension at MTP joints |
| Dorsal interosseous  | Base of metatarsals     | Sides of toes                    | Abduction, flexion and extension at MTP joints |

40. On the picture below draw the muscles from the table above:

