CHAPTER

9

The Thigh

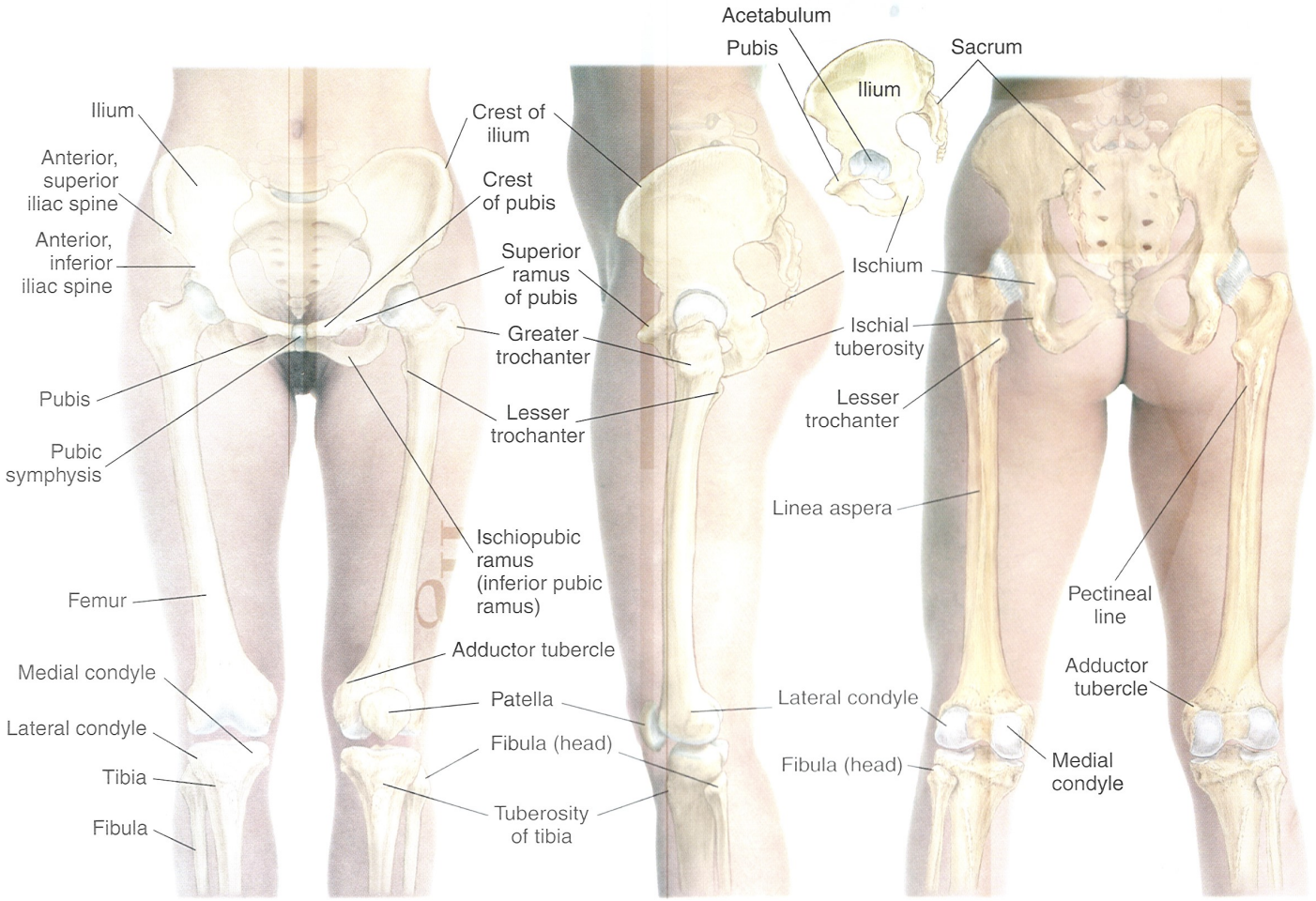


Plate 9-1 Skeletal features of the thigh

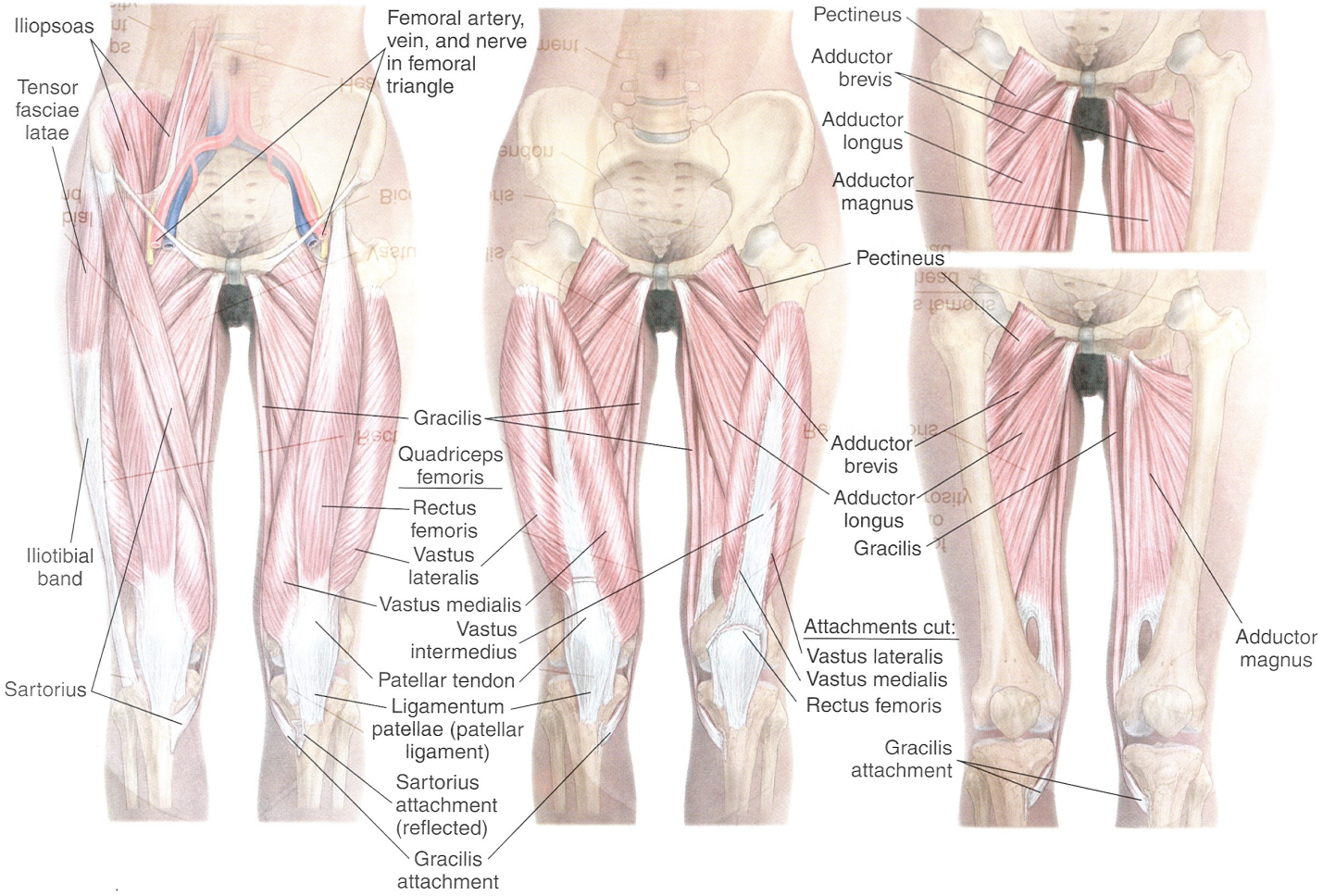


Plate 9-2 Muscles of the thigh, anterior view

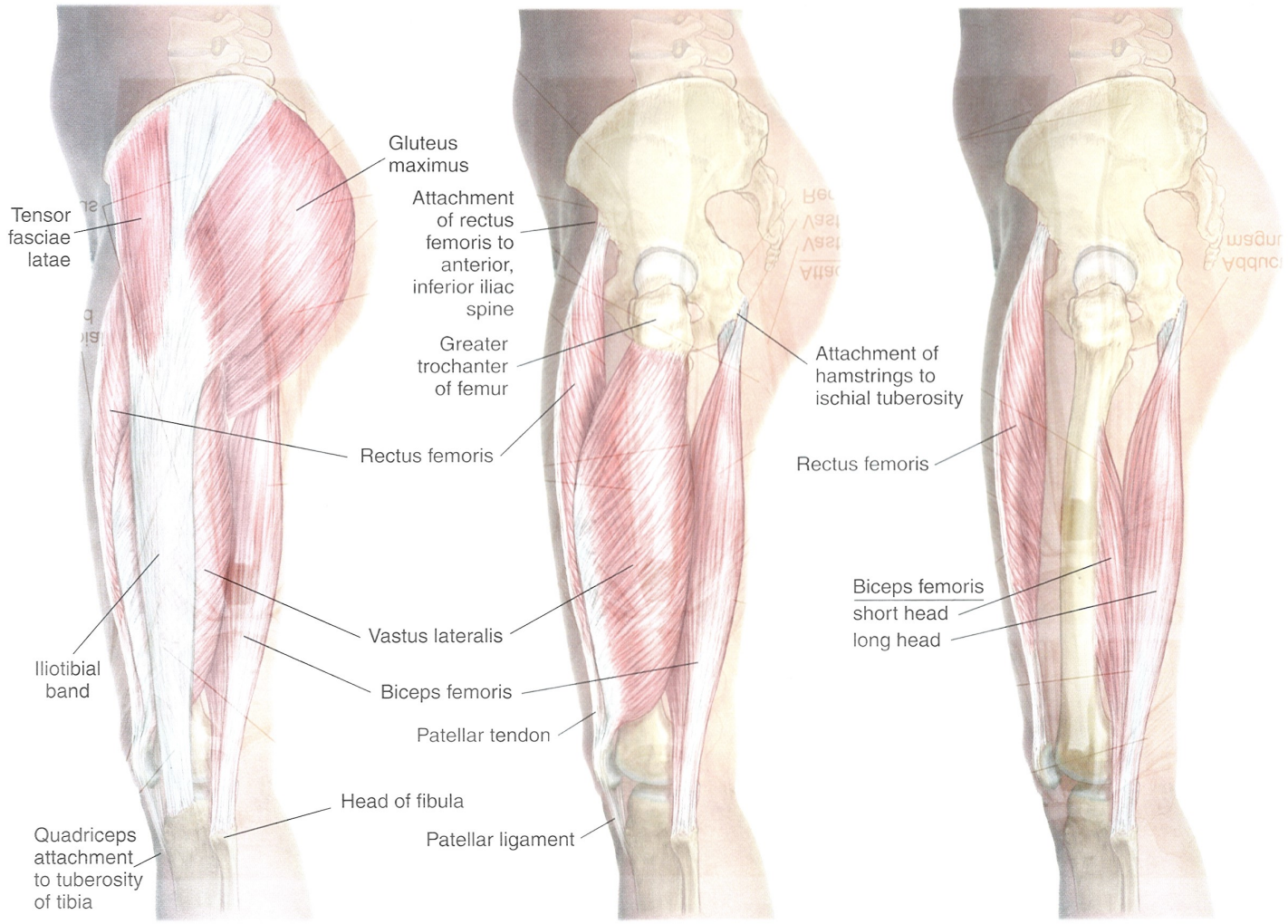


Plate 9-3 Muscles of the thigh, lateral view

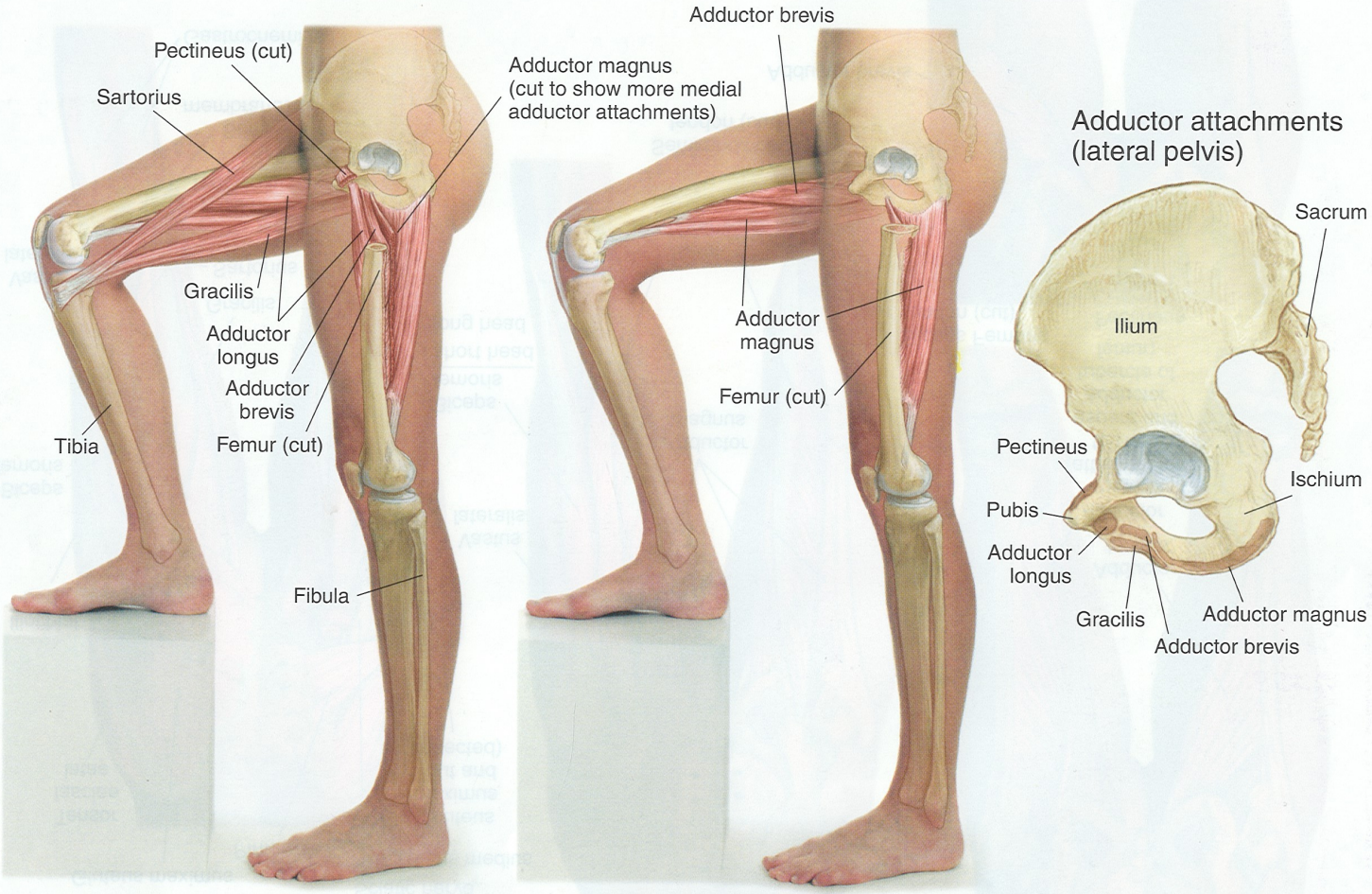


Plate 9-4 Adductors of the hip, medial and lateral views

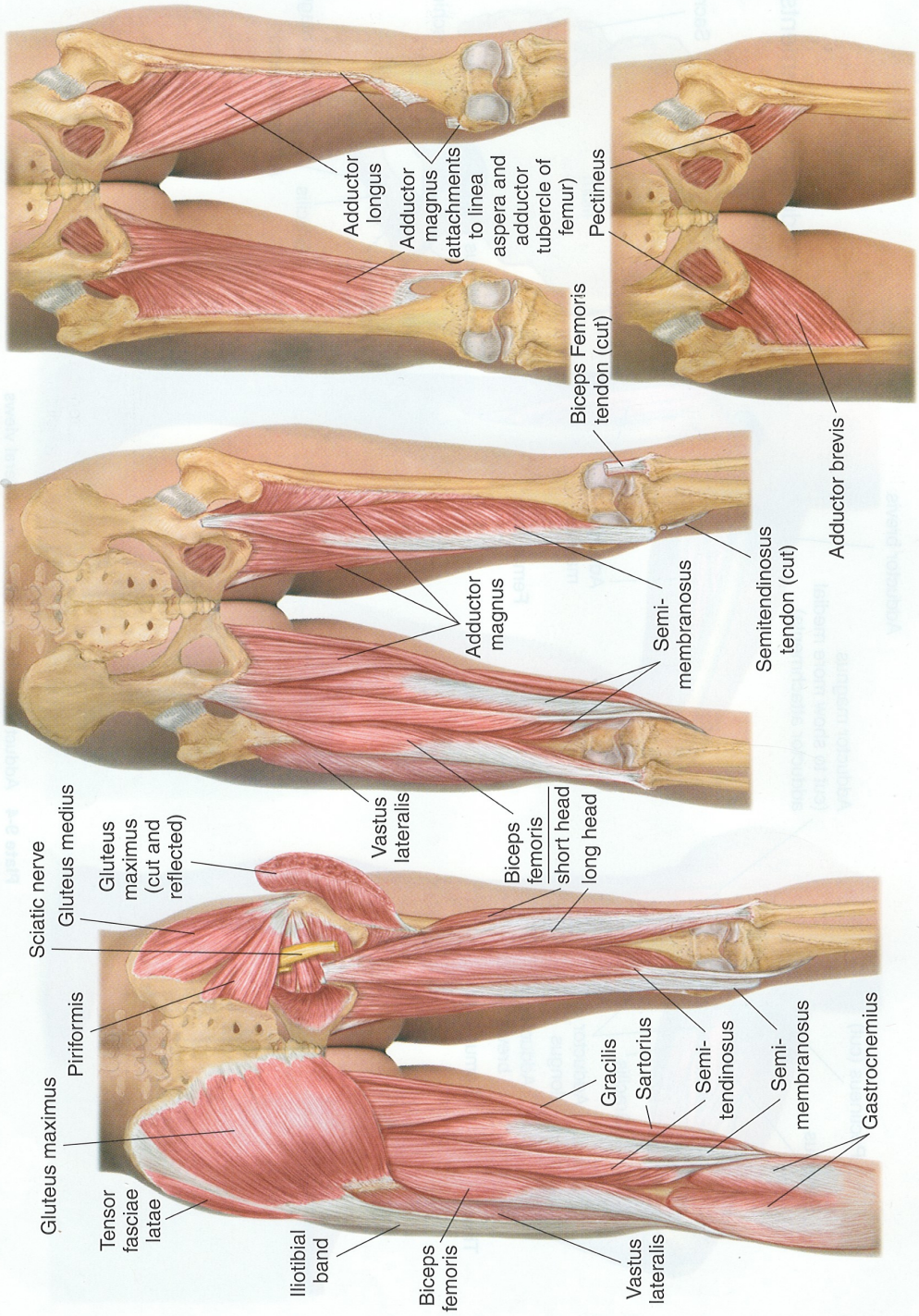


Plate 9-5 Muscles of the thigh, posterior view

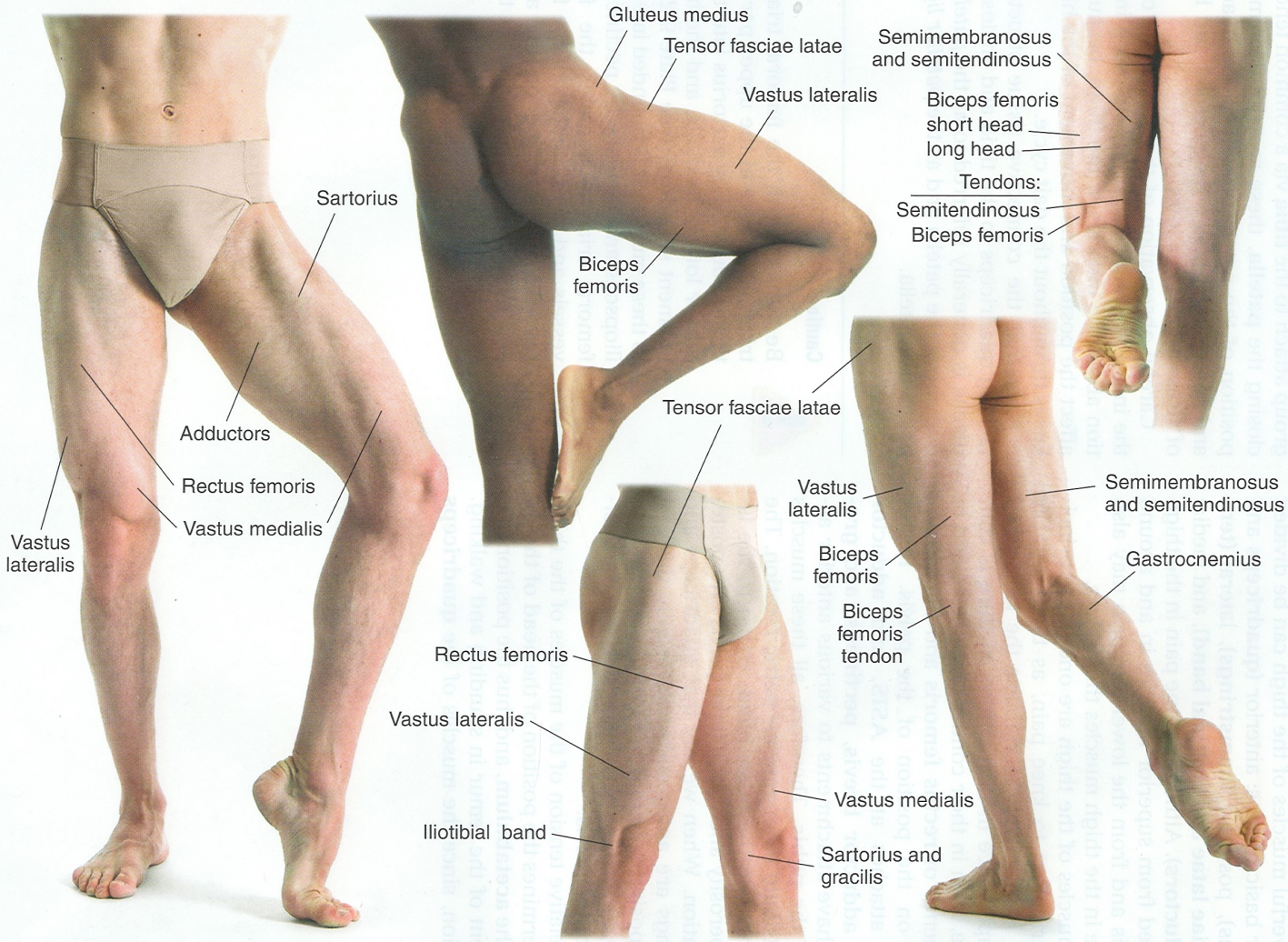


Plate 9-6 Surface anatomy of the thigh

OVERVIEW OF THE REGION

The powerful muscles of the thigh can be divided into four basic groups: anterior **(quadriceps** and **sartorius),** posterior **(hamstrings),** lateral **(tensor fasciae latae** and **iliotibial band),** and medial **(hip adductors**). Although some pain in the thigh is referred from superior muscles in and around the pelvis and from the lower leg, pain may also originate in the thigh muscles themselves.

The muscles of the thigh are one of the principal contributors to knee pain, as their primary function is to move and stabilize the knee joint. Their importance in maintaining posture is considerable, both in their control of the knee and in the influence of **rectus femoris** and the hip adductors on the position of the pelvis. Rectus femoris attaches at the **ASIS,** and **adductor longus, adductor brevis, pectineus,** and **gracilis** all have attachments to various anterior aspects of the **pubis.** Therefore, all these muscles can contribute to an anterior pelvic rotation. The hamstrings, on the other hand, attach to the ischial tuberosity and can pull the pelvis into posterior rotation. When we say that quadriceps and hamstrings are antagonists, we usually think of their opposing functions in flexing and extending the knee, but they are also antagonists in the positioning of the pelvis.

The relative tension of the muscles of the thigh also determines the position of the **head of the femur** in the **acetabulum,** and thus the position and movement of the femur in standing and walking. In addition, since the muscles of the **quadriceps** group attach to the **tibia** via a common tendon enclosing the **patella,** these muscles determine the position of the patella. Together, the quadriceps and hamstrings dictate the position and balance of stress in the knee joint.

Careful observation of the gait of the client in the initial examination will reveal much information about the muscles of the thigh, because they affect the position and movement of the hips and knees throughout the gait cycle.

Note that the connective tissue structure attaching quadriceps to the tibia and enclosing the patella is generally referred to as the *patellar tendon* above the patella and as the *patellar ligament* below the patella.

Caution

Be familiar with the femoral triangle, a triangular space at the upper part of the thigh, bounded by sartorius laterally, adductor longus medially, and the inguinal ligament superiorly (see Plate 9-2). Deep to these muscles it is bounded laterally by iliopsoas and medially by pectineus. The femoral triangle contains the femoral vessels and the branches of the femoral nerve. When working on the anterior and medial thigh, take care not to exert pressure on these structures.

MUSCLES OF THE ANTERIOR THIGH

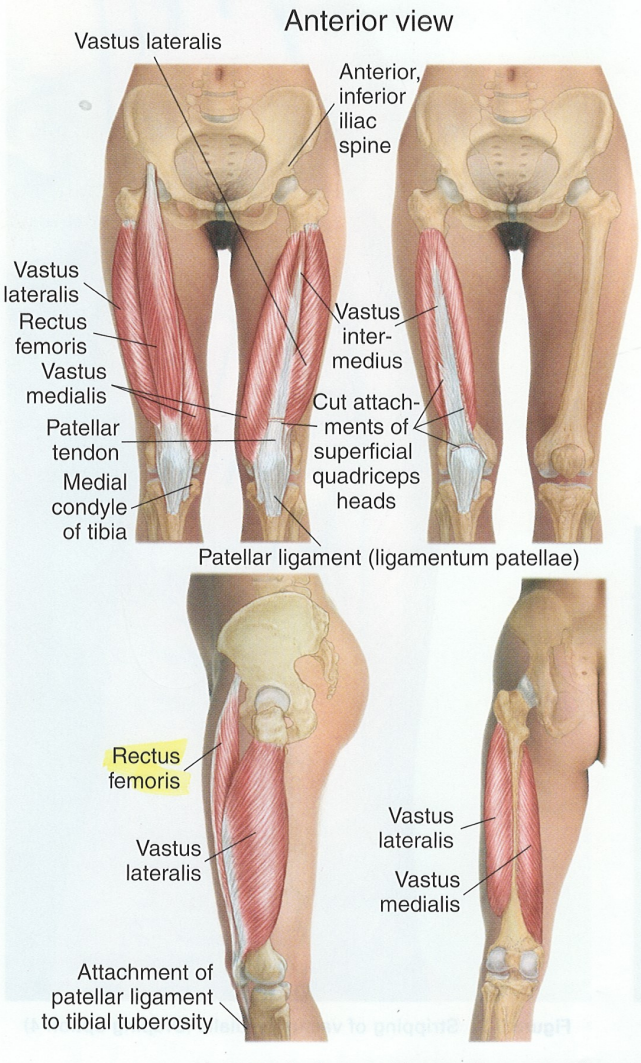
Quadriceps Femoris (Fig. 9-1)

KWAD-ris-seps fe-MOR-is, FEM-or-is

Etymology Latin *quadri,* four + *caput,* head, therefore, four-headed

Comment

Three of the muscles (the vasti) of the quadriceps group cross only the knee joint, while one (rectus femoris) crosses both the hip and the knee joint.



All have a common inferior attachment via the patellar tendon.

Attachments

- Inferiorly, by four heads: rectus femoris, vastus lateralis, vastus intermedius, and vastus medialis to the patella, and thence by ligamentum patellae (patellar ligament) to the tibial tuberosity; vastus medialis also to the medial condyle of the tibia
- Superiorly, as follows:
  - Rectus Femoris: to the anterior inferior spine of ilium and upper margin of acetabulum
  - Vastus lateralis: to the lateral lip of the linea aspera as far as the greater trochanter
  - Vastus medialis: to the medial lip of the linea aspera
  - Vastus intermedius: to the upper three-fourths of the anterior surface of the shaft of the femur

Figure 9-1 Anatomy of quadriceps femoris

Action

Extends the knee; flexes the hip by the action of rectus femoris

Referral area

- Vastus medialis and intermedius: to the anterior thigh and the knee
- Vastus lateralis: to the lateral thigh and the knee

Other muscles to examine

- Hip adductors
- Tensor fasciae latae and iliotibial band
- Obturator internus (may cause pain in the anterior thigh through entrapment of the obturator nerve)

Figure 9-2 Stripping of vastus medialis with the fingertips (Draping option 4)

Figure 9-3 Stripping of vastus medialis (Draping option 4)

Figure 9-4 Stripping of rectus femoris with the thumb (Draping option 5)

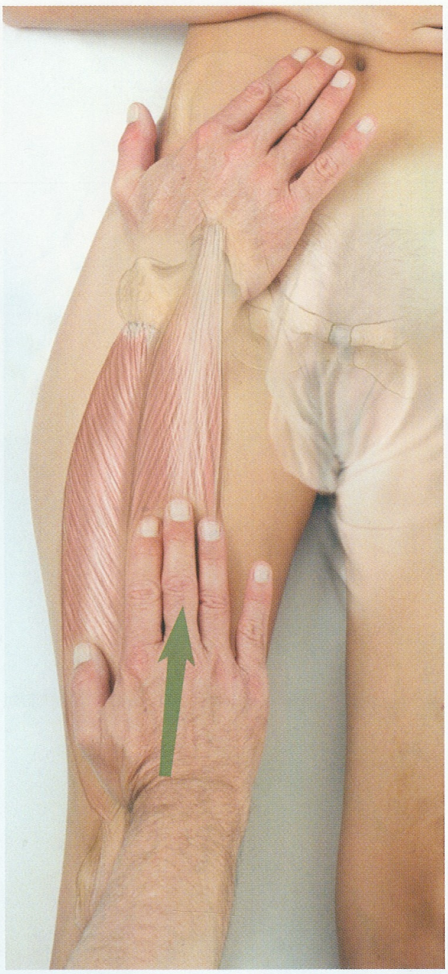


Figure 9-5 Stripping of rectus femoris (Draping option 5)

Manual Therapy

STRIPPING

- The client lies supine.
- The therapist stands beside the client at the lower legs.
- Place the heel of the hand, the thumb, or the fingertips (Fig. 9-2) on the quadriceps tendon where it attaches to the patella on the medial side.
- Pressing firmly into the tissue, slide along vastus medialis to its attachment on the upper femur (Fig. 9-3).
- Beginning again at the kneecap in the center, repeat this procedure, continuing the stroke along rectus femoris to its attachment at the ASIS (Fig. 9-4–9-5).
- Repeat the same procedure laterally on vastus lateralis (Fig. 9-6–9-7).
- Note: Vastus intermedius lies deep to the other quadriceps muscles, and is therefore treated through them.

Figure 9-6 Stripping of vastus lateralis with the fingertips (Draping option 4)

Figure 9-7 Stripping of vastus lateralis (Draping option 4)

CROSS-FIBER FRICTION FOR THE PATELLAR TENDON AND LIGAMENT

- The client lies supine.
- The therapist stands beside the client at the legs.
- Place the thumb on the patellar tendon (superior to the patella).
- Press firmly into the tissue, and move the thumb back and forth across the tendon until you feel a softening and relaxation in the tissue (Fig. 9-8A).
- Repeat this procedure on the patellar ligament (inferior to the patella) (Fig. 9-8B).

CROSS-FIBER FRICTION ON DEEP SURFACE OF PATELLA

- With one hand, displace the patella away from yourself.
- Place the fingertips of the other hand under the patella.
- Pressing upward into the patella, move your fingertips back and forth until you feel a softening and relaxation in the tissue (Fig. 9-9A).
- Repeat the procedure medially (Fig. 9-9B).

Caution

The above procedure should not be performed on a client who has had recent knee surgery, or is scheduled for such surgery. If a client has had knee surgery in the past, or complains of knee pain, question the client thoroughly before proceeding. When in doubt, have the client obtain permission from her or his physician before proceeding.

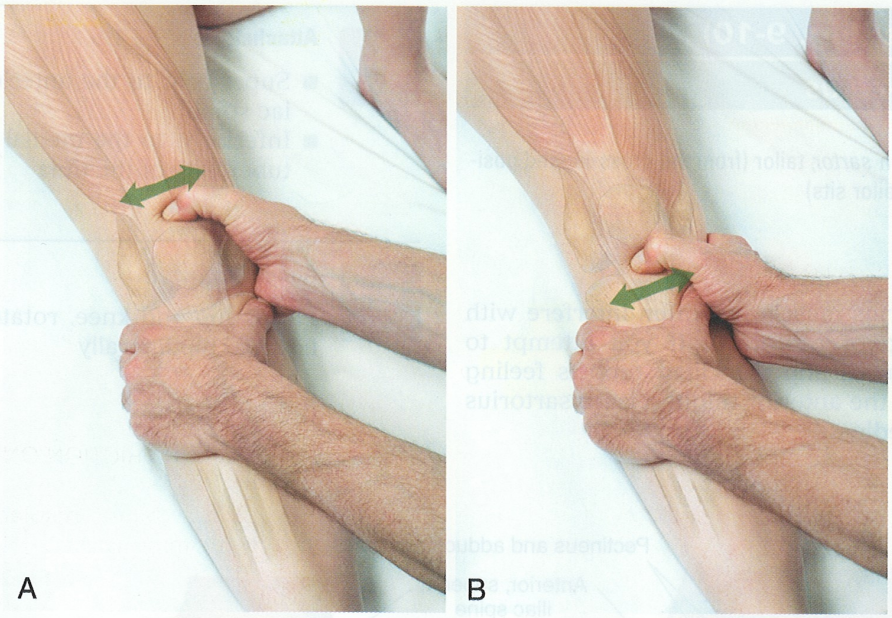


Figure 9-8 Cross-fiber friction of the patellar tendon (A) and ligament (B) (Draping option 4)

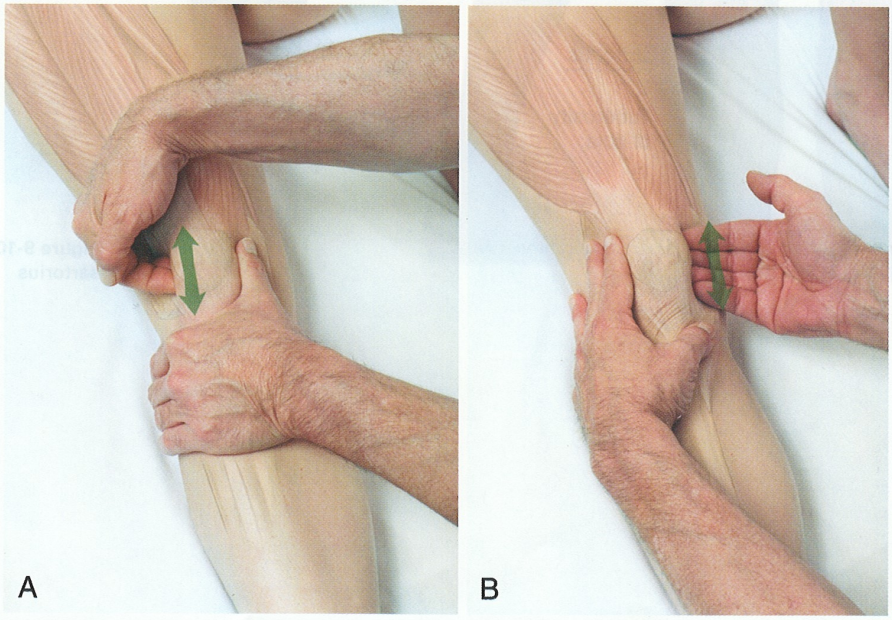


Figure 9-9 Cross-fiber friction underneath the patella laterally (A) and medially (B) (Draping option 4)

Sartorius (Fig. 9-10)

sar-TORE-ee-us

Etymology Latin *sartor,* tailor (from the cross-legged position in which a tailor sits)

Overview

A tight sartorius muscle will often interfere with the stretching of piriformis. If you attempt to stretch piriformis and the client reports feeling the stretch in the anterior thigh, release sartorius before proceeding.

Attachments

- Superiorly, to the anterior superior iliac spine
- Inferiorly, to the medial border of the tuberosity of the tibia

Action

Flexes hip and knee, rotates knee medially and hip laterally

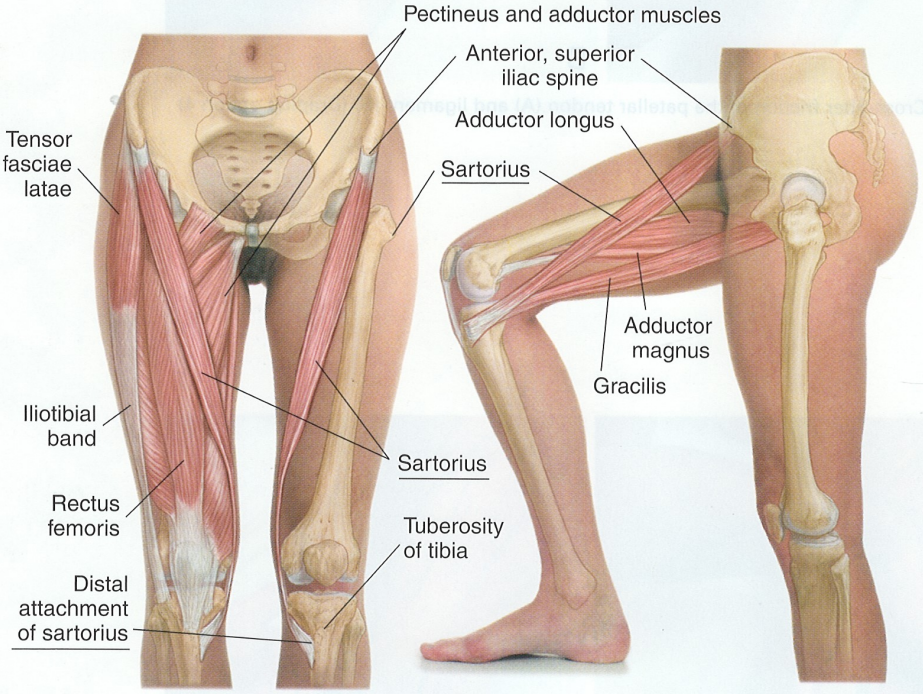


Figure 9-10 Anatomy of sartorius

Figure 9-11 Stripping of sartorius with the fingertips (Draping option 5)

Referral Area

To the anterior and medial aspects of the thigh

Other Muscles to Examine

- Quadriceps
- Hip adductors

Manual Therapy

STRIPPING

- The client lies supine.
- The therapist stands beside the client at the legs.
- Place the heel of the hand, thumb, or fingertips on the medial thigh just superior to the patella.
- Pressing firmly into the tissue, slide the fingertips diagonally along the muscle across the quadriceps to its attachment on the ASIS (Fig. 9-11).

MUSCLES OF THE POSTERIOR THIGH (HAMSTRINGS)

Overview

From the word "ham," denoting the buttock and back of the thigh, "hamstrings" is an old term for the muscles of the posterior thigh, comprising the long head of biceps, the semitendinosus, and the semimembranosus muscles. Note that these muscles cross both the hip and knee joints, and are therefore important in both movement and stabilization of these joints.

Semitendinosus (Fig. 9-12)

SEM-i-ten-di-NO-sus

Etymology Latin *semi,* half + *tendinosus,* tendinous

Attachments

- Superiorly, to the ischial tuberosity
- Inferiorly, to the medial surface of the superior fourth of the shaft of the tibia

Action

Extends hip, flexes knee and rotates it medially when flexed

Referral Area

Over the back of the leg from the buttock to the mid-calf

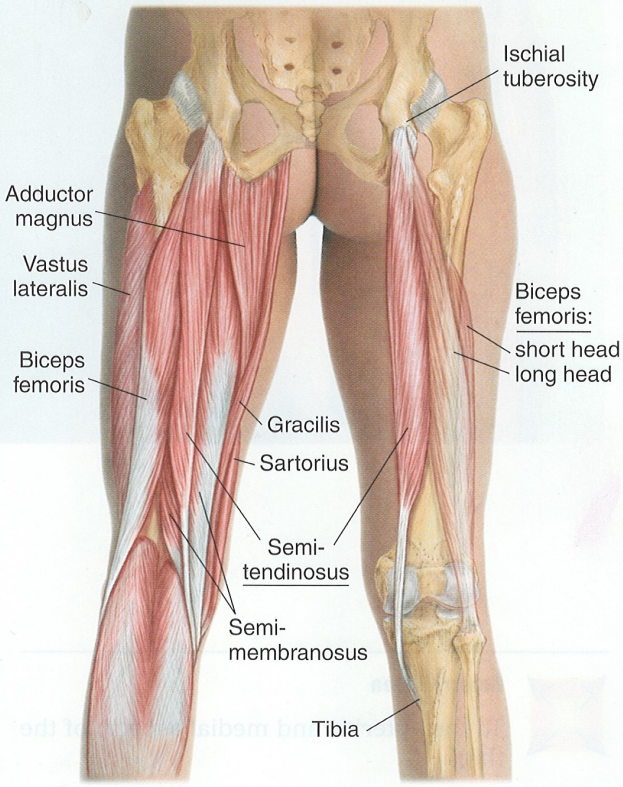


Figure 9-12 Anatomy of semitendinosus

Other Muscles to Examine

- Quadratus lumborum
- Piriformis
- Gluteal muscles
- Hip adductors

Semimembranosus (Fig. 9-13)

SEM-i-mem-bra-NO-sus

Etymology Latin *semi,* half + *membranosus,* membranous

Attachments

- Superiorly, to the ischial tuberosity
- Inferiorly, to the posterior aspect of the medial condyle of the tibia

Action

Flexes knee and rotates knee medially when flexed; contributes to the stability of extended knee by making capsule of knee joint tense; extends hip

Referral Area

Over the back of the leg from the buttock to the mid-calf

Other Muscles to Examine

- Quadratus lumborum
- Piriformis
- Gluteal muscles
- Hip adductors

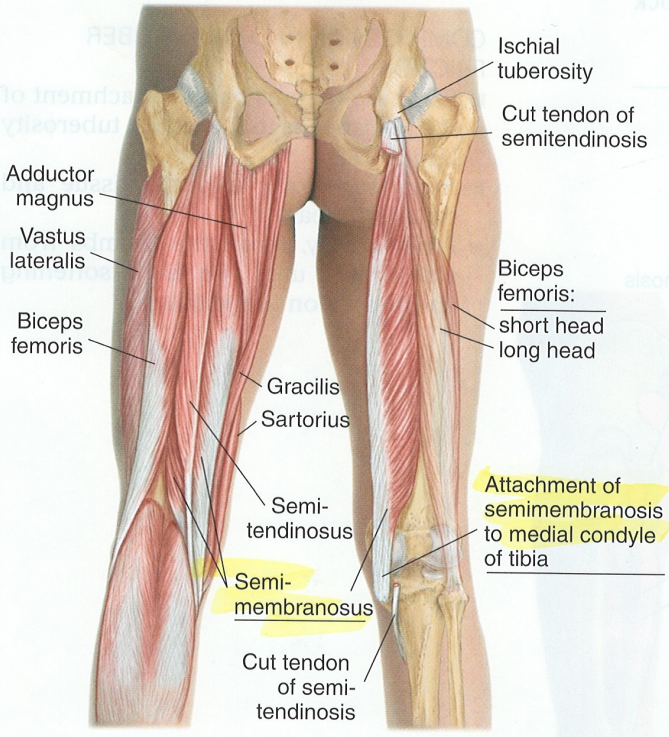


Figure 9-13 Anatomy of semimembranosus

Biceps Femoris (Fig. 9-14)

BUY-seps fe-MORE-is

Etymology Latin *biceps*, two-headed + *femoris*, of the femur

Attachments

- Superiorly, the long head to the ischial tuberosity, the short head to the lower half of the lateral lip of linea aspera
- Inferiorly, to the head of the fibula

Action

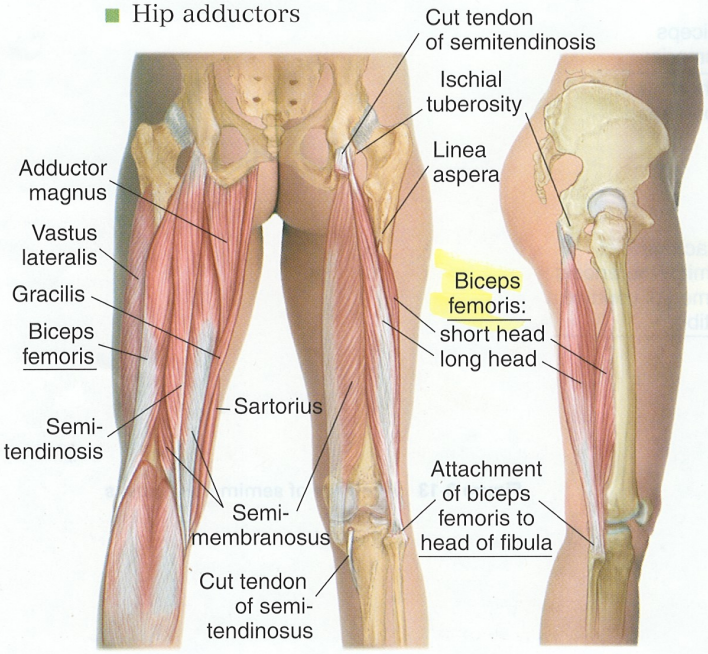
Flexes knee and rotates flexed knee laterally; long head extends hip

Referral Area

Over the back of the leg from the buttock to the mid-calf

Other Muscles to Examine

- Quadratus lumborum
- Piriformis
- Gluteal muscles
- Hip adductors



Manual Therapy for Hamstrings

STRIPPING

- The client lies prone.
- The therapist stands beside the client at the calves.
- Place the fingertips, heel of the hand, forearm, or knuckles on the medial aspect of the hamstrings just superior to the knee.
- Pressing firmly into the tissue, slide along the muscle to its attachment on the ischial tuberosity (Fig. 9-15).
- Beginning in the center, repeat this procedure (Fig. 9-16).
- Repeat the same procedure on the lateral aspect (Fig. 9-17).

Caution

At the beginning of the above procedure, avoid pressure into the popliteal space behind the knee.

COMPRESSION AND CROSS-FIBER FRICTION

- Place the thumbs on the attachment of the hamstrings to the ischial tuberosity (Fig. 9-18).
- Press superiorly into the tissue and hold for release.
- Alternatively, move the thumbs from side to side until you feel a softening and relaxation in the tissue.

Figure 9-14 Anatomy of biceps femoris

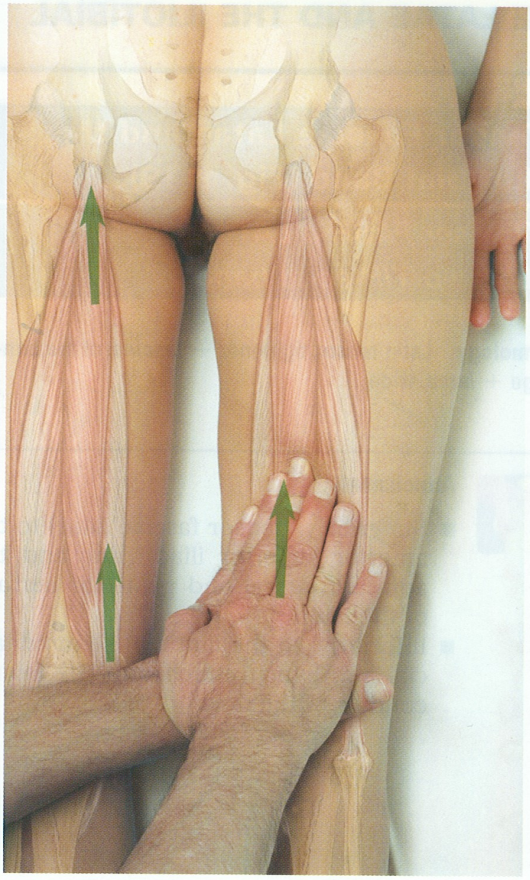


Figure 9-15 Stripping of medial hamstrings with the fingertips (Draping option 10)

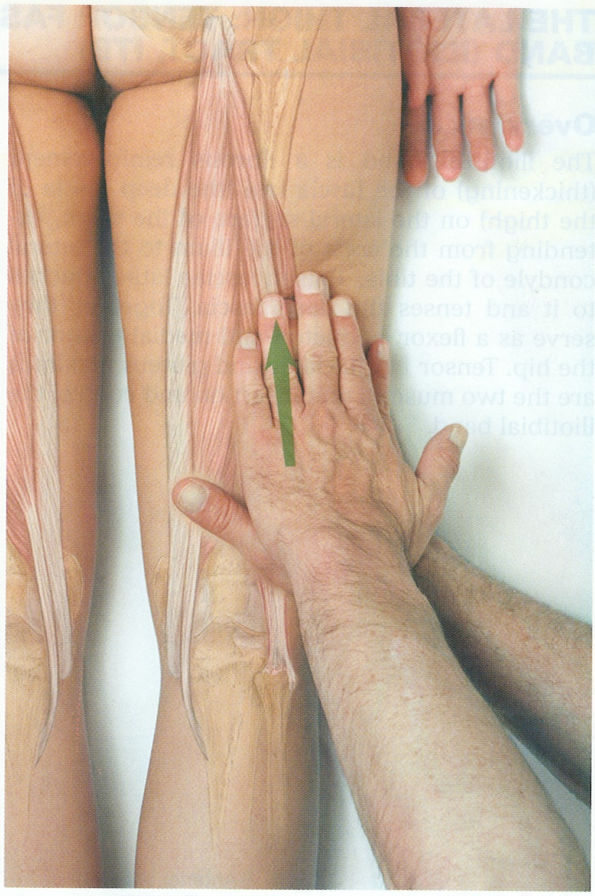


Figure 9-17 Stripping of lateral hamstrings with the fingertips (Draping option 10)

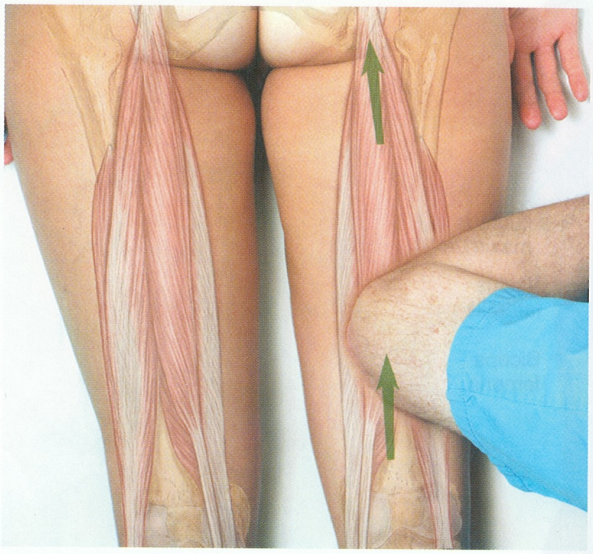


Figure 9-16 Stripping of hamstrings with the forearm (Draping option 10)

Figure 9-18 Compression of hamstring attachments against the ischial tuberosity (Draping option 10)

THE LATERAL THIGH: TENSOR FASCIAE LATAE AND THE ILIOTIBIAL BAND (ILIOTIBIAL TRACT, ITB)

Overview

The iliotibial band is a fibrous reinforcement (thickening) of the fascia lata (the deep fascia of the thigh) on the lateral surface of the thigh, extending from the crest of the ilium to the lateral condyle of the tibia. Tensor fasciae latae attaches to it and tenses the deep fascia. Together they serve as a flexor, abductor, and medial rotator of the hip. Tensor fasciae latae and gluteus maximus are the two muscles that insert on and control the iliotibial band.

Tensor Fasciae Latae and the Iliotibial Band (Fig. 9-19)

TEN-ser FASH-a LAT-a
ILL-ee-o-TIB-ee-al band

Etymology Latin *tensor*, tightener + *fasciae*, of the bandage + *latae*, wide

Attachments

- Superiorly, (tensor fasciae latae) to the anterior superior iliac spine and the adjacent lateral and posterior surface of the ilium
- Inferiorly, to the iliotibial band of fascia lata, which attaches to the lateral condyle of the tibia

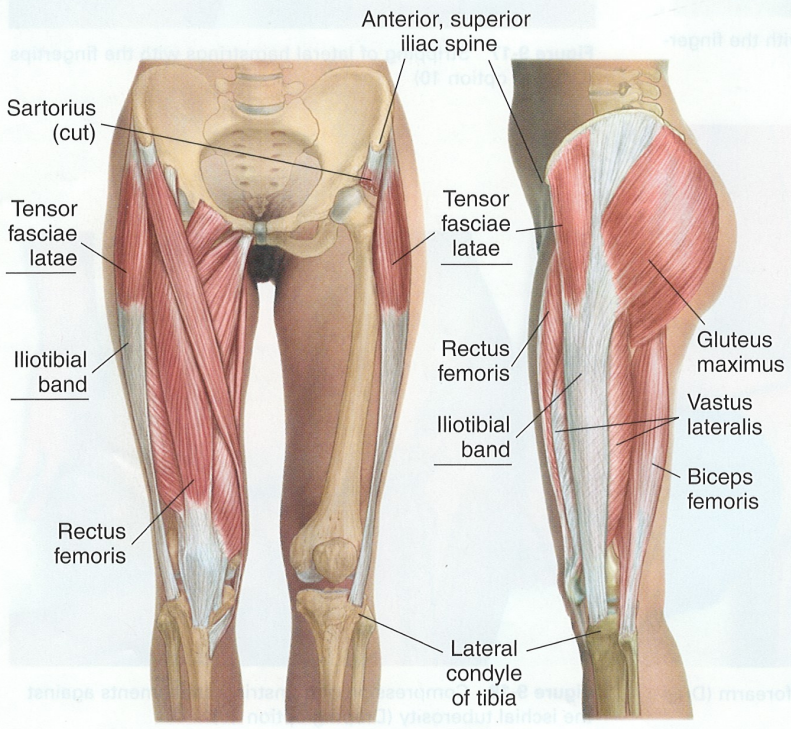


Figure 9-19 Anatomy of tensor fasciae latae and the iliotibial band

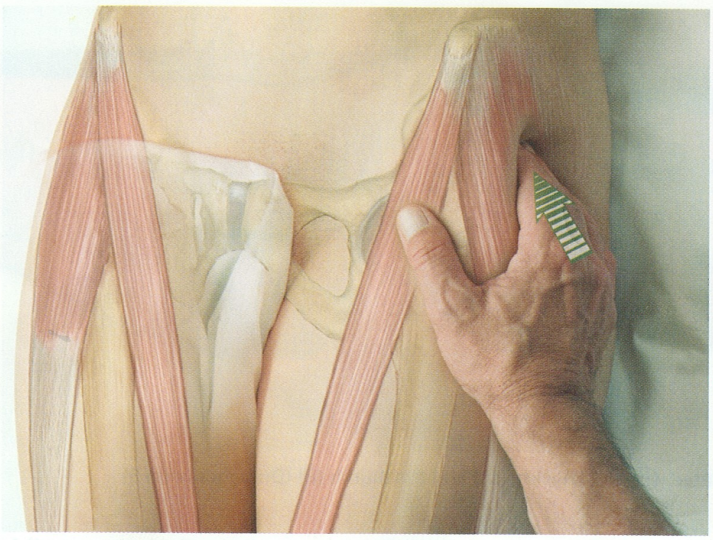


Figure 9-20 Compression of tensor fasciae latae with the fingertips (Draping option 5)

Action

Tenses fascia lata; flexes, abducts and medially rotates hip; also contributes to the lateral stability of the knee

Referral Area

To the lateral aspect of the thigh

Other Muscles to Examine

Vastus lateralis

Manual Therapy for Tensor Fasciae Latae

COMPRESSION

- The client lies supine.
- The therapist stands beside the client at the knee.
- Place the fingertips on the tensor fasciae latae between the greater trochanter and the crest of the ilium.
- Press firmly into the tissue, searching for tender areas. Hold for release (Fig. 9-20).

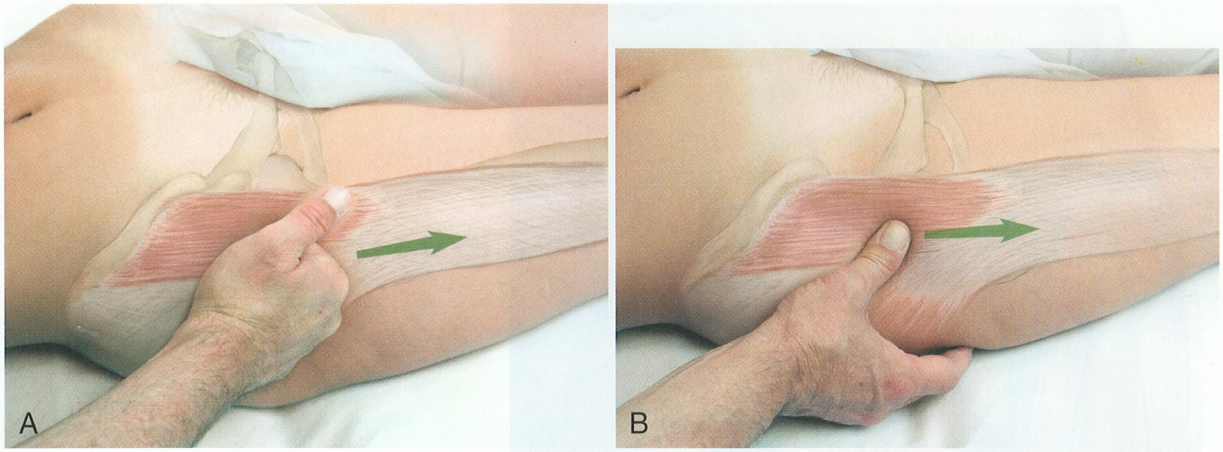


Figure 9-21 Stripping of tensor fasciae latae with the knuckles (A) and the thumb (B) (Draping option 5)

STRIPPING

- The client lies supine.
- The therapist stands beside the client at the chest.
- Place the fingertips, thumb, or knuckles on the tensor fasciae latae just below the iliac crest.
- Pressing firmly into the tissue, glide along the muscle past the greater trochanter (Fig. 9-21, Fig. 9-22).
- Continue the stroke with the next technique for the ITB.

Figure 9-22 Stripping of iliotibial band with client supine (Draping option 5)

Manual Therapy for the Iliotibial Band (ITB)

STRIPPING

- The client lies supine.
- The therapist stands beside the client at the waist.
- Place the heel of the hand or knuckles on the ITB just below the greater trochanter.
- Pressing firmly into the tissue, glide along the muscle to the lateral condyle of the tibia (Fig. 9-22).

STRIPPING

- The client lies on her or his side, with the lower leg straight, and the upper leg flexed at the hip and the knee.
- The therapist stands behind the client at the pelvis.
- Place the heel of the hand or knuckles on the ITB just below the greater trochanter.
- Pressing firmly into the tissue, slide along the muscle to the lateral condyle of the tibia (Fig. 9-23).

Figure 9-23 Stripping of iliotibial band with client side-lying (Draping option 12)

MUSCLES OF THE MEDIAL THIGH (HIP ADDUCTORS)

Overview

Although we associate the hip adductors chiefly with adduction of the hip, they contribute to flexion, extension, rotation, and stability of the hip in complex ways in standing, walking, climbing stairs, and other activities involving the legs. In your assessment of the client's gait, observe the medial thigh closely for any anomalies such as twitches or catches in the motion of the thigh.

Adductor Magnus (Fig. 9-24)

ad-DUCK-ter MAG-nus

Etymology Latin *ad*, toward + *ducere*, pull + *magnus*, large

Overview

The superior part of adductor magnus is called adductor minimus.

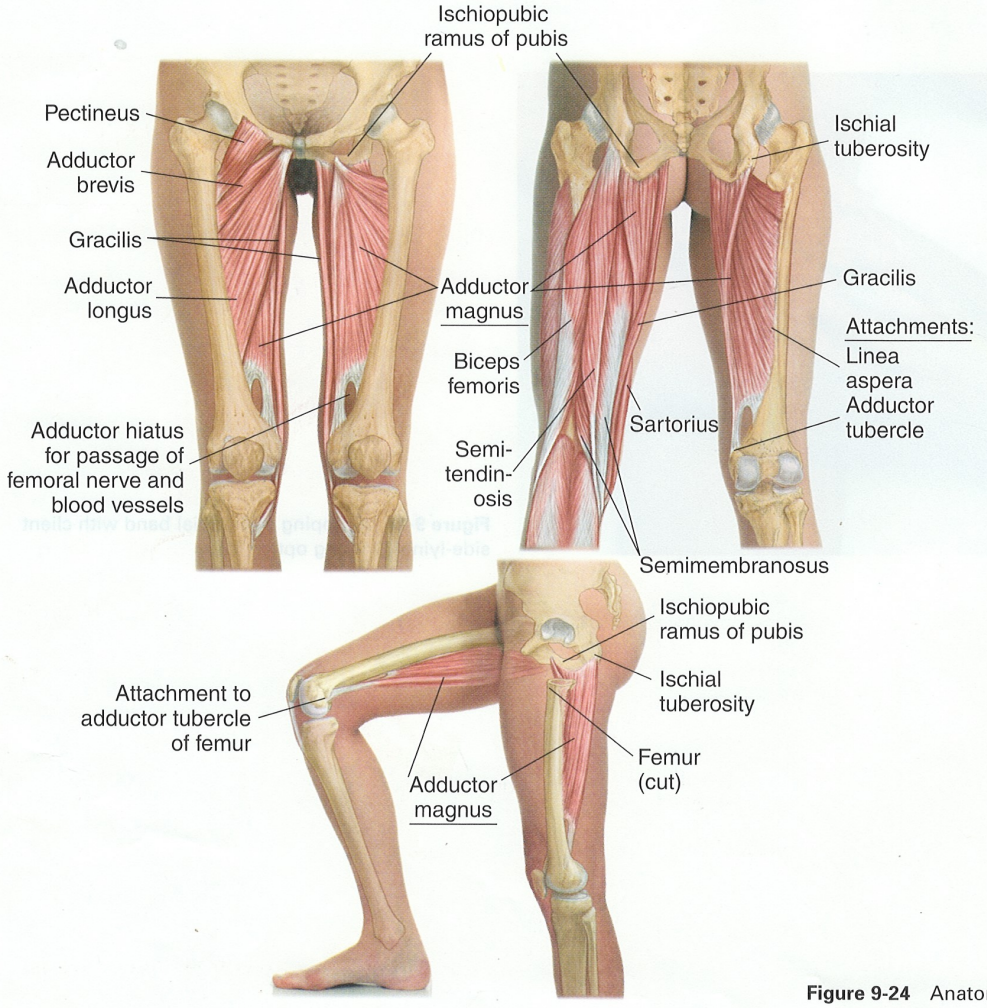


Figure 9-24 Anatomy of adductor magnus

Attachments

- Superiorly, to the ischial tuberosity and ischiopubic ramus
- Inferiorly, to the linea aspera and adductor tubercle of the femur

Action

Adducts and extends hip

Referral Area

To the medial aspect of the thigh

Other Muscles to Examine

Other hip adductors

Adductor Longus (Fig. 9-25)

ad-DUCK-ter LONG-gus

Etymology Latin *ad,* toward + *ducere,* pull + *longus,* long

Attachments

- Superiorly, symphysis and crest of pubis
- Inferiorly, to the middle third of medial lip of linea aspera

Action

Adducts hip

Referral Area

To the medial aspect of the thigh

Other Muscles to Examine

Other hip adductors

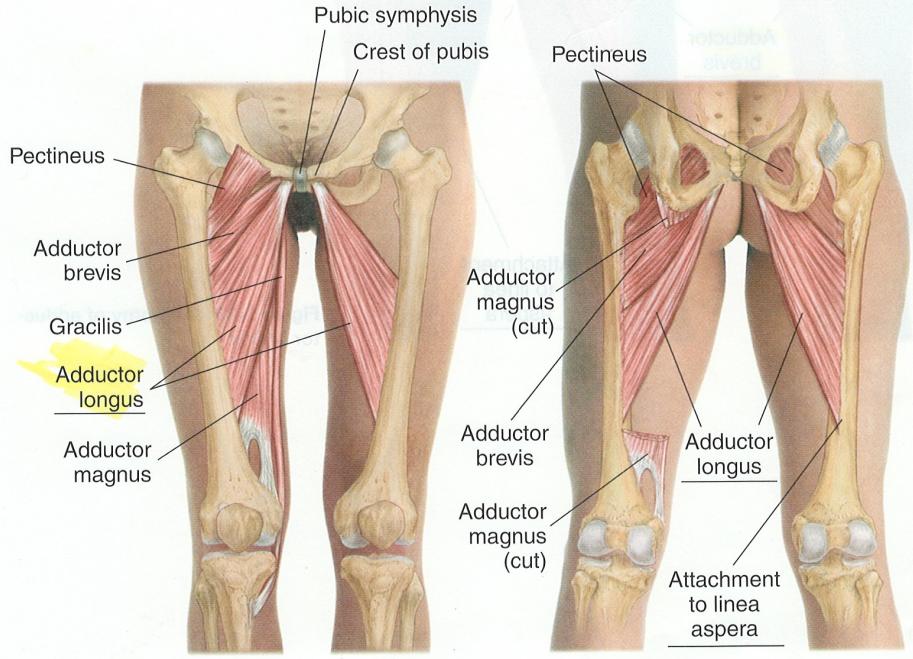


Figure 9-25 Anatomy of adductor longus

Adductor Brevis (Fig. 9-26)

ad-DUCK-ter BREV-is

Etymology Latin *ad,* toward + *ducere,* pull + *brevis,* short

Attachments

- Superiorly, to the inferior ramus of the pubis
- Inferiorly, to the upper third of medial lip of linea aspera

Action

Adducts hip

Referral Area

To the medial aspect of the thigh

Other Muscles to Examine

Other hip adductors

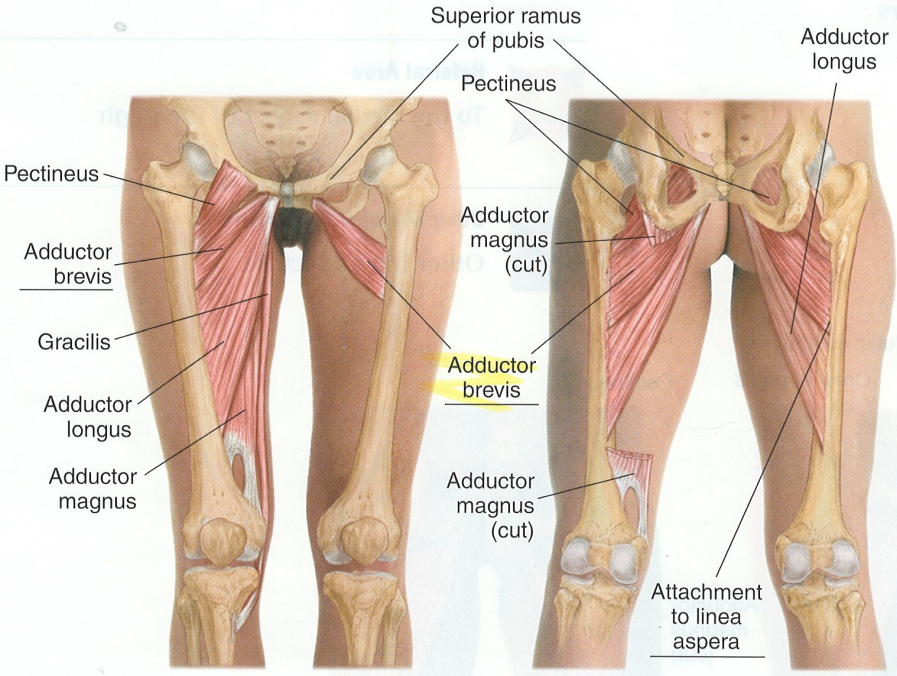


Figure 9-26 Anatomy of adductor brevis

Pectineus (Fig. 9-27)

peck-TIN-ee-us

Etymology Latin *pecten*, comb

Overview

Pectineus is named for its attachment to the pecten, a sharp ridge on the superior pubic ramus.

Attachments

- Superiorly, to the crest of the pubis
- Inferiorly, to the pectineal line of femur between the lesser trochanter and the linea aspera

Action

Adducts and assists in flexion of hip

Referral Area

To the medial aspect of the thigh

Other Muscles to Examine

Other hip adductors

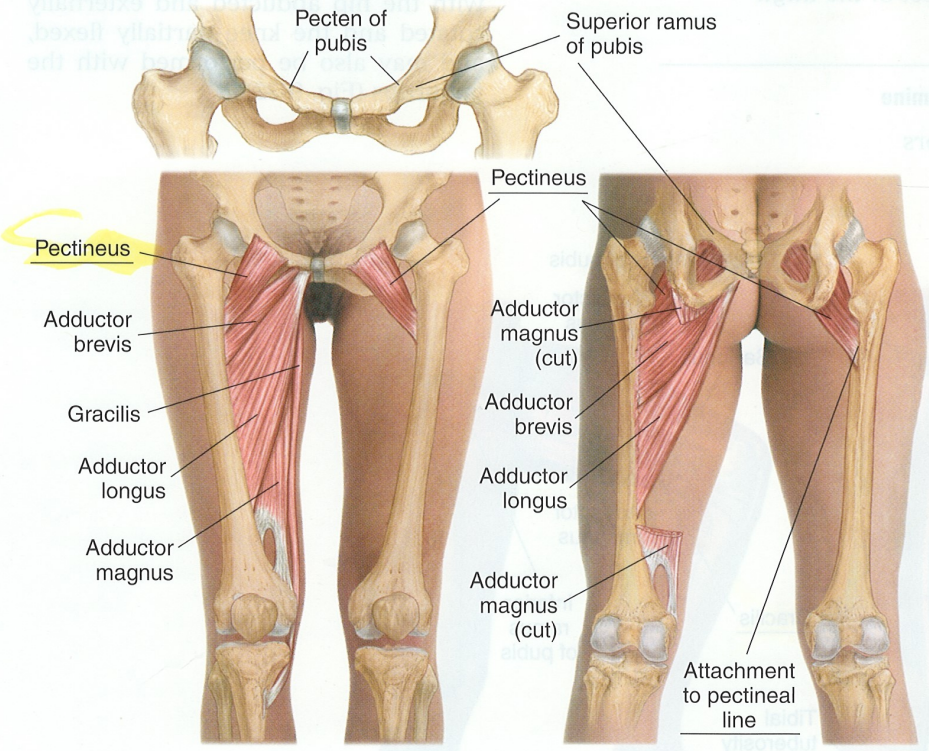


Figure 9-27 Anatomy of pectineus

Gracilis (Fig. 9-28)

GRASS-ill-iss, gra-SILL-iss

Etymology Latin *gracilis*, slender

Attachments

- Superiorly, to the body and inferior ramus of the pubis near the symphysis
- Inferiorly, to the medial shaft of the tibia below the tibial tuberosity

Action

Adducts the hip, flexes the knee, rotates the flexed knee medially

Referral Area

To the medial aspect of the thigh

Other Muscles to Examine

Other hip adductors

Manual Therapy for the Hip Adductors

Note: Some clients may be more comfortable keeping underwear on for work on the hip adductors.

COMPRESSION OF THE ADDUCTOR ATTACHMENTS

- The client lies supine.
- The therapist stands beside the client at the knee.
- Place your thumb on the lateral edge of the pubic crest on the attachment of pectineus (Fig. 9-29).
- Press firmly into the tissue, looking for tender spots. Hold for release.
- Shift the thumb inferiorly and posteriorly along the pubic crest, compressing each adductor attachment (Fig. 9-30).
- Repeat this procedure until you reach the attachment of adductor magnus (Fig. 9-31).
- This technique may also be performed with the hip abducted and externally rotated and the knee partially flexed, and may also be performed with the fingertips (Fig. 9-32).

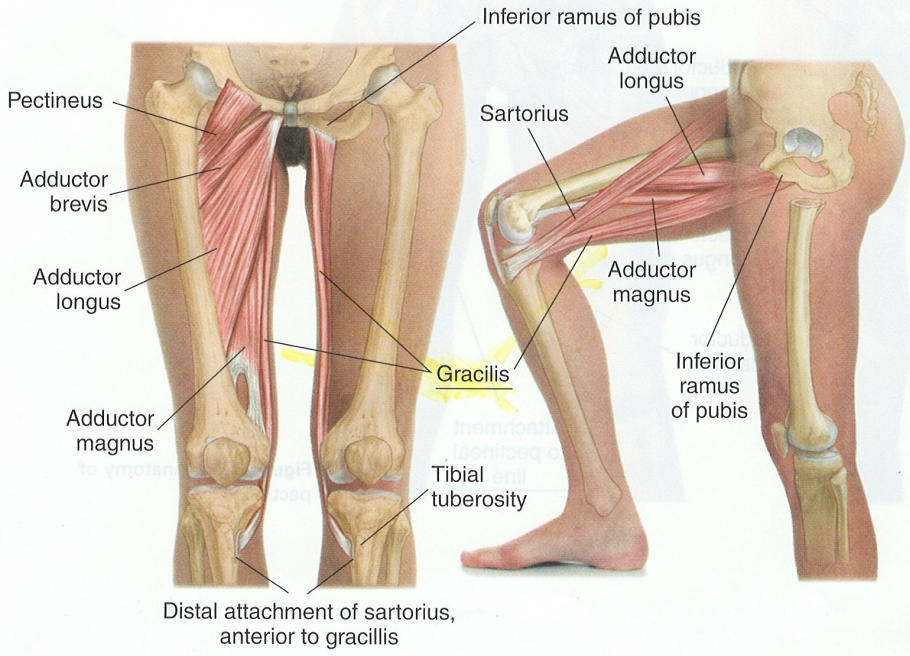


Figure 9-28 Anatomy of gracilis

Figure 9-29 Compression of attachment of pectineus (Draping option 5)

Figure 9-30 Compression of attachment of adductor brevis (Draping option 5)

Figure 9-31 Compression of attachment of adductor magnus with thumb (Draping option 5)

Figure 9-32 Compression of attachment of adductor magnus with fingertips, hip abducted and rotated (Draping option 5)

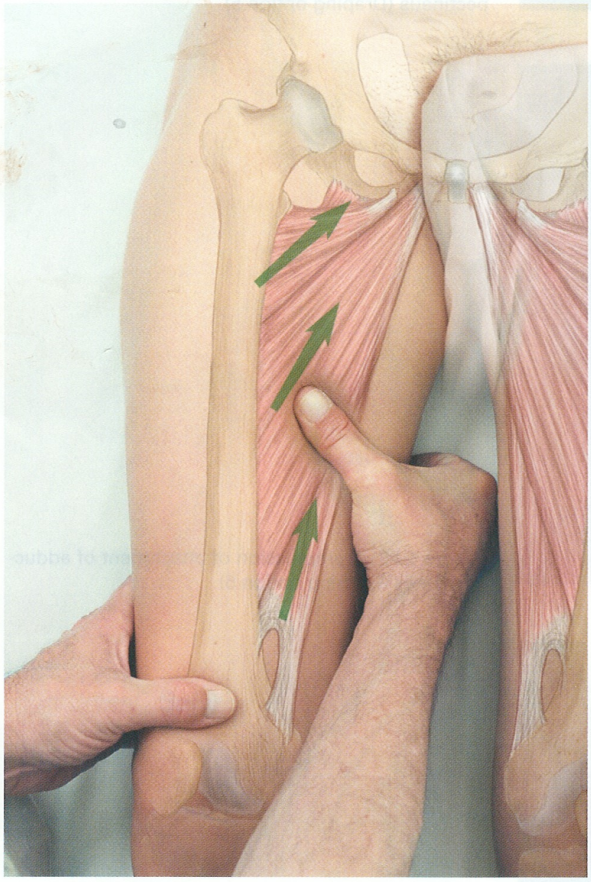


Figure 9-33 Stripping of adductor magnus and longus with thumb, client supine, leg straight, hip slightly abducted (Draping option 5)

STRIPPING AND COMPRESSION OF THE HIP ADDUCTORS

- The client lies supine, either with the leg straight and the hip slightly abducted, or with the hip abducted and externally rotated and the knee partially flexed.
- The therapist stands beside the client at the knees.
- Place the fingertips or thumb(s) just above the medial epicondyle of the femur.
- Pressing firmly into the tissue, glide the fingertips along the adductors to the anterior aspect of the pubic arch.
- Beginning at the same spot, repeat this procedure, ending each time more posteriorly along the pubis (Fig. 9-33, Fig. 9-34, Fig. 9-35).
- You may also perform compression against the femur along each hip adductor in the same position, using the thumbs (Fig. 9-36).
- Both of these procedures may also be performed with the client lying on her side, with either the lower leg straight and the upper leg flexed at the hip and the knee (Fig. 9-37), or with the upper leg straight and the lower leg flexed at the hip and the knee (Fig. 9-38). However, in these positions it is not possible to work close to the attachments without contacting the genitals.

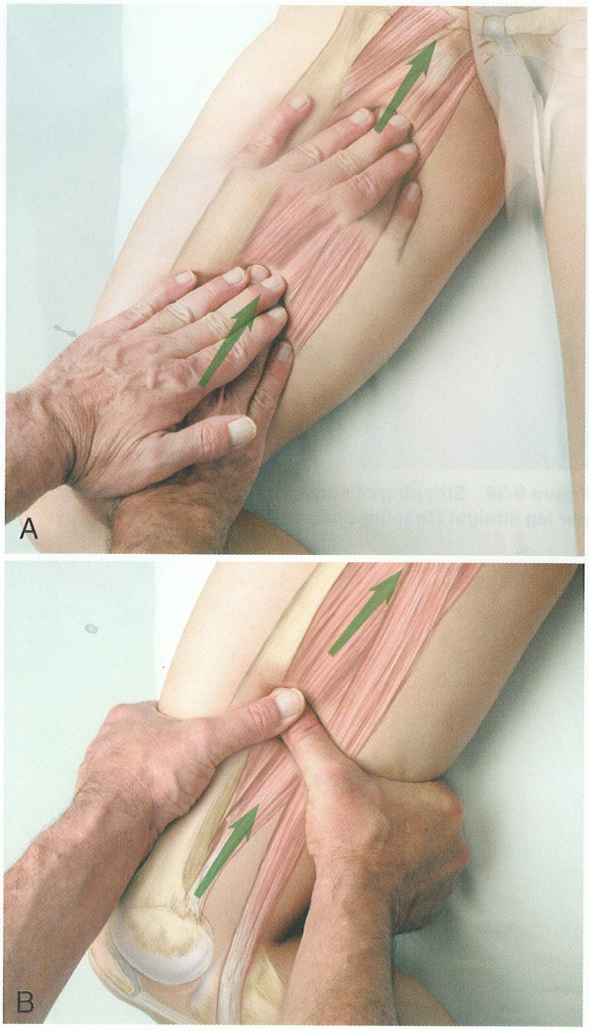


Figure 9-34 Stripping of adductor magnus and gracilis, client supine, hip abducted and externally rotated, hip and knee flexed: (A) with fingertips, (B) with thumb (Draping option 5)

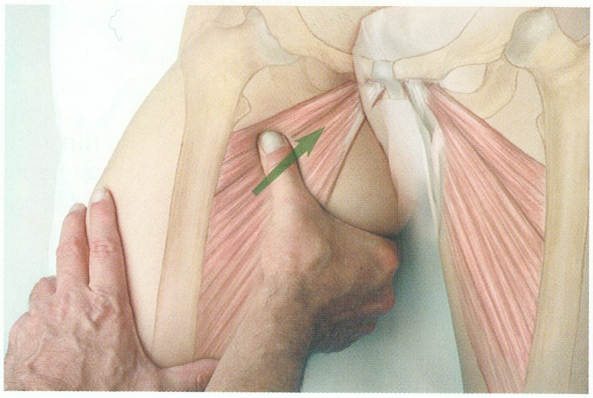


Figure 9-35 Stripping of adductor brevis and longus with thumb, client supine, hip abducted and externally rotated, hip and knee flexed (Draping option 5)

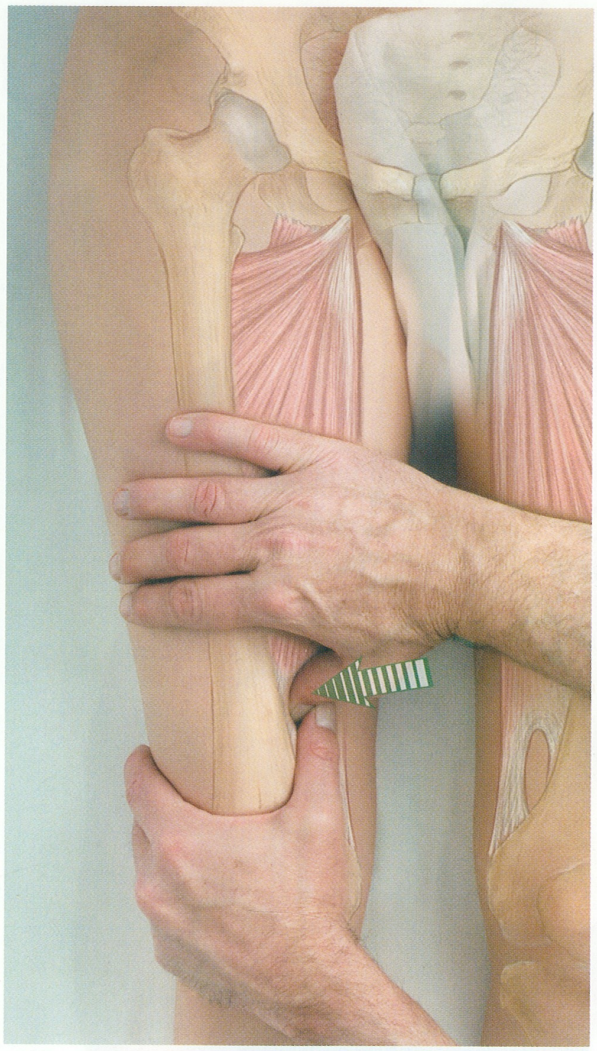


Figure 9-36 Compression of adductor magnus with thumb, leg straight (Draping option 5)

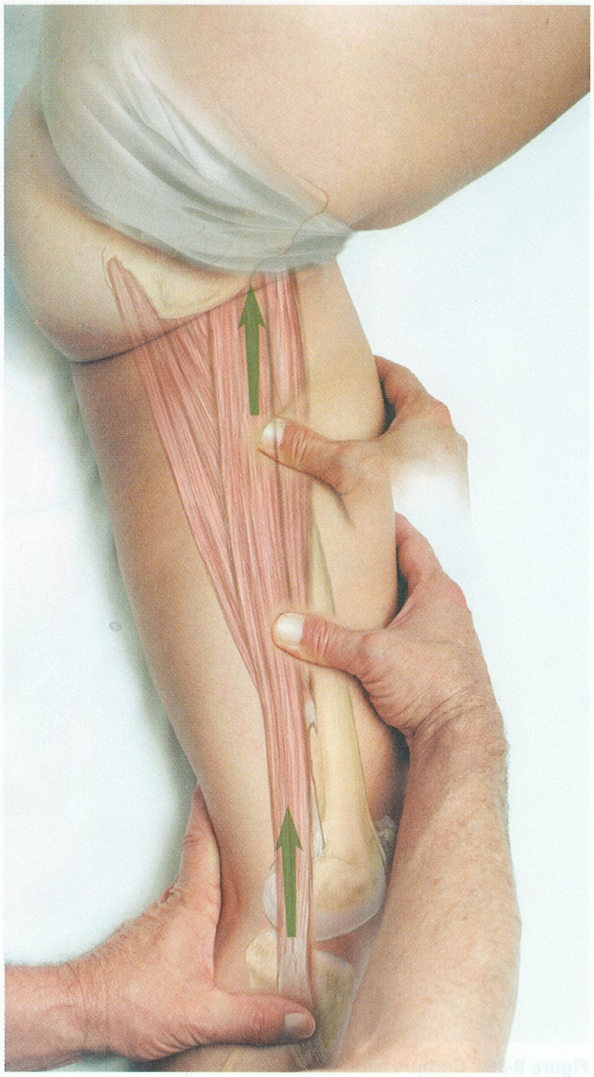


Figure 9-37 Stripping of adductors with client side-lying, lower leg straight (Draping option 12 or underwear)

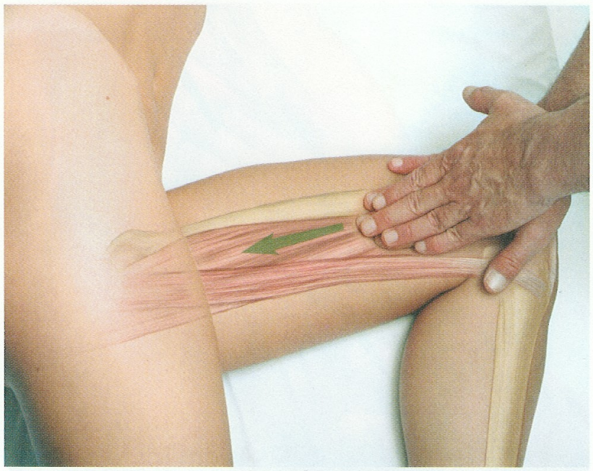


Figure 9-38 Stripping of adductors with client side-lying, upper leg straight (Draping option 12 or underwear)