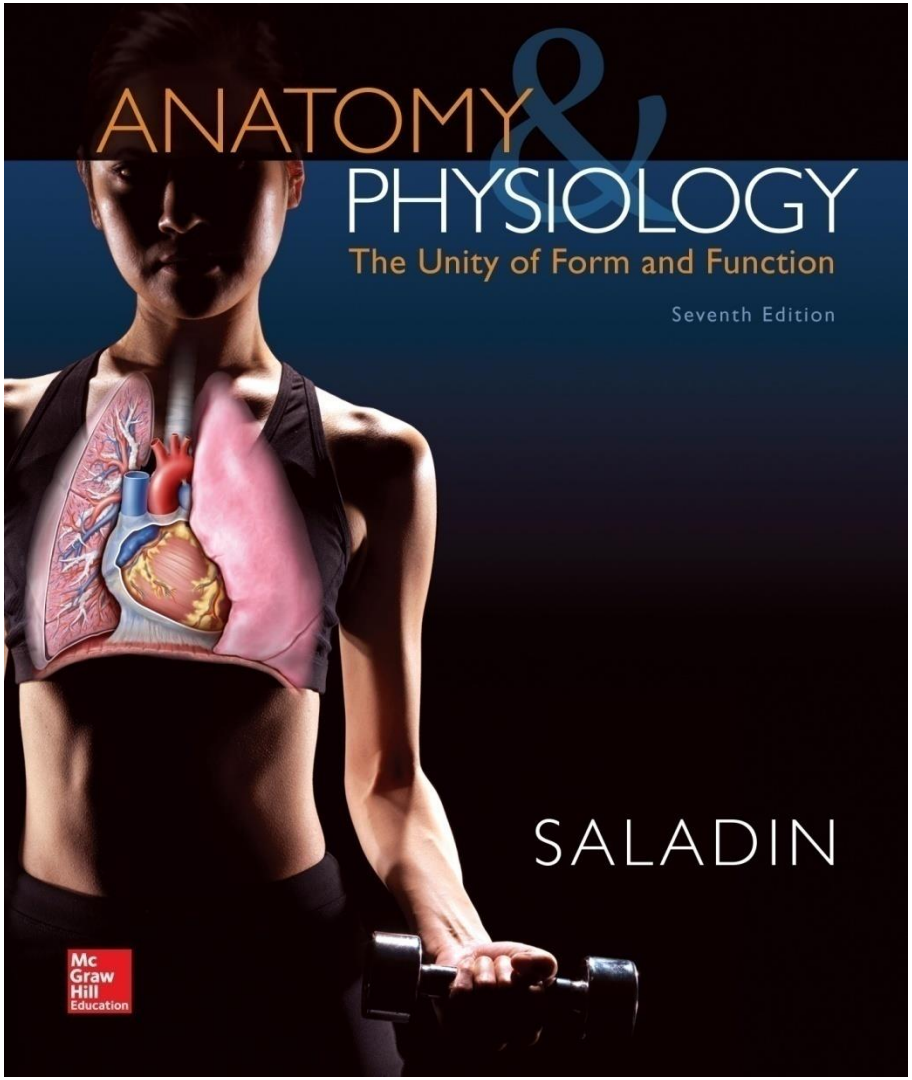
HUMAN ATLAS:
THE MUSCULAR SYSTEM



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The Muscular System

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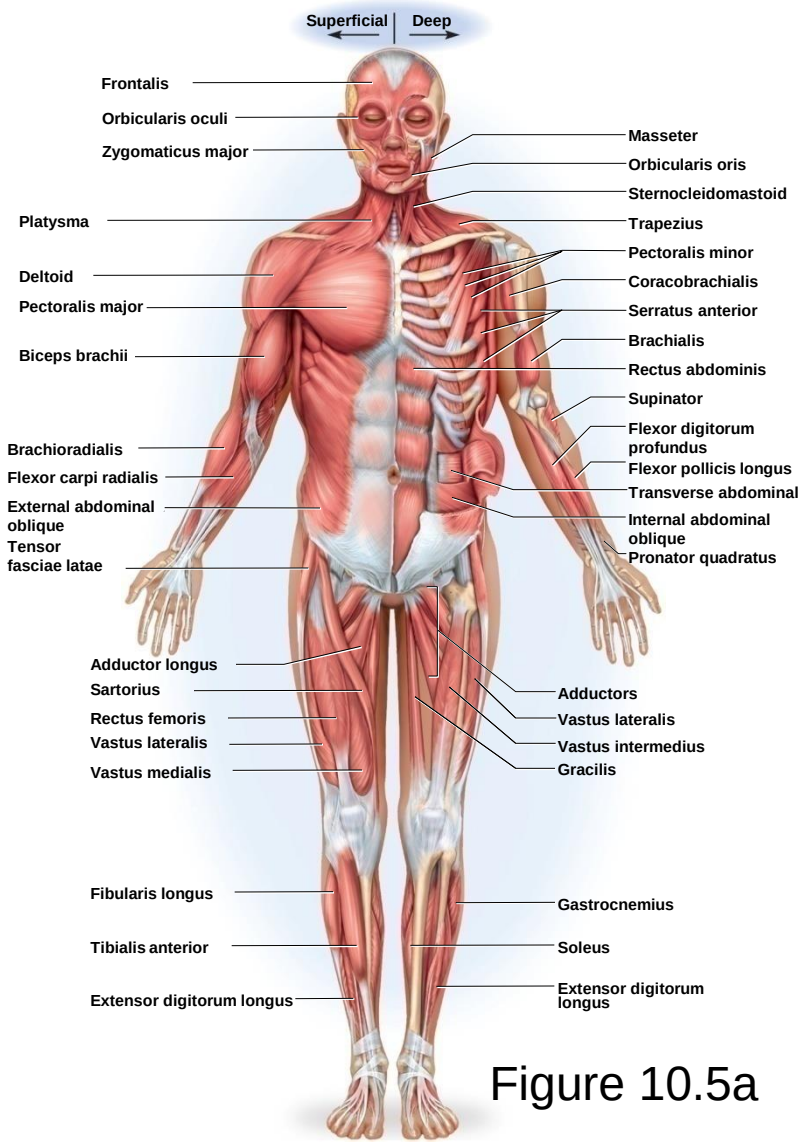

(a) Anterior view

Figure 10.5a

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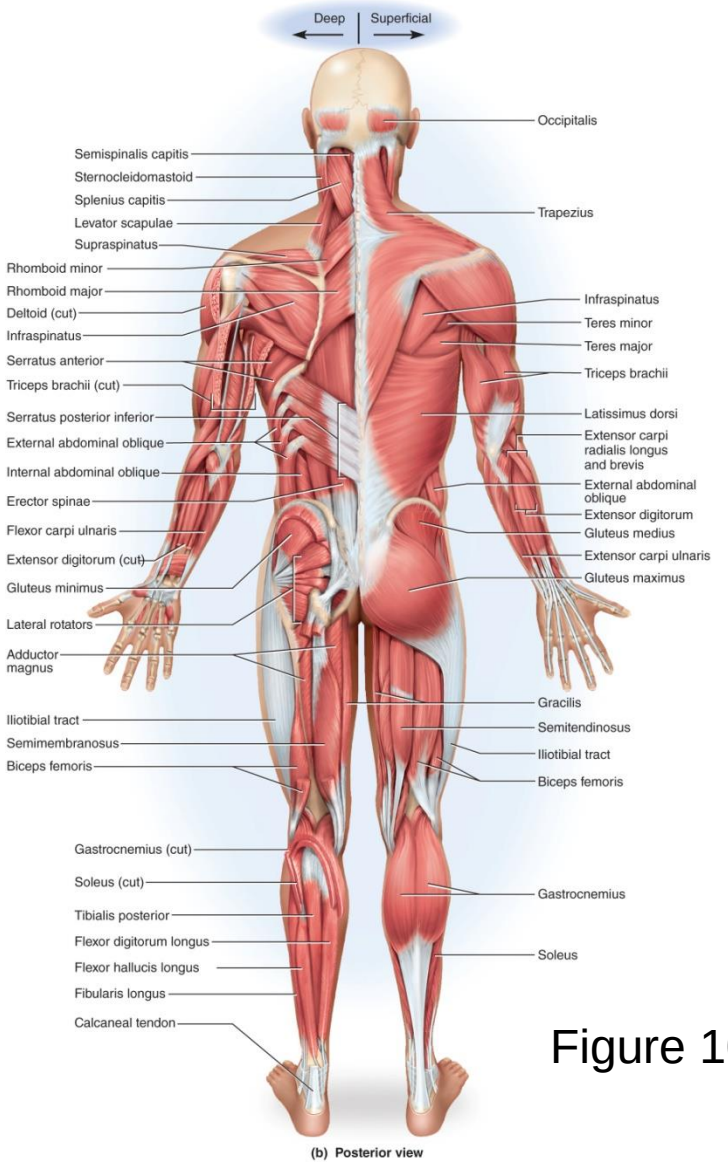

(b) Posterior view

Figure 10.5b

A Learning Strategy

- **Examine models, cadavers, dissected animals, or a photographic atlas**
- **Palpate muscles on yourself if possible**
- **Locate origins and insertions of muscles on an articulated skeleton**
- **Study derivation of each muscle name**
  - Usually describes the muscle's location, appearance, origin, insertion, or action
- **Say the names aloud to yourself or study partner, and spell them correctly**

Muscles of the Head and Neck

- **Expected Learning Outcomes**
  - Name and locate the muscles that produce facial expression.
  - Name and locate the muscles used for chewing and swallowing.
  - Name and locate the neck muscles that move the head.
  - Identify the origin, insertion, action, and innervation of any of these muscles.

Muscles of Facial Expression

- Muscles that insert in the dermis and subcutaneous tissues
- Tense the skin and produce facial expressions
- Innervated by facial nerve (CN VII)
- Paralysis causes face to sag
- Found in scalp, forehead, around the eyes, nose, and mouth, and in the neck

Muscles of Facial Expression

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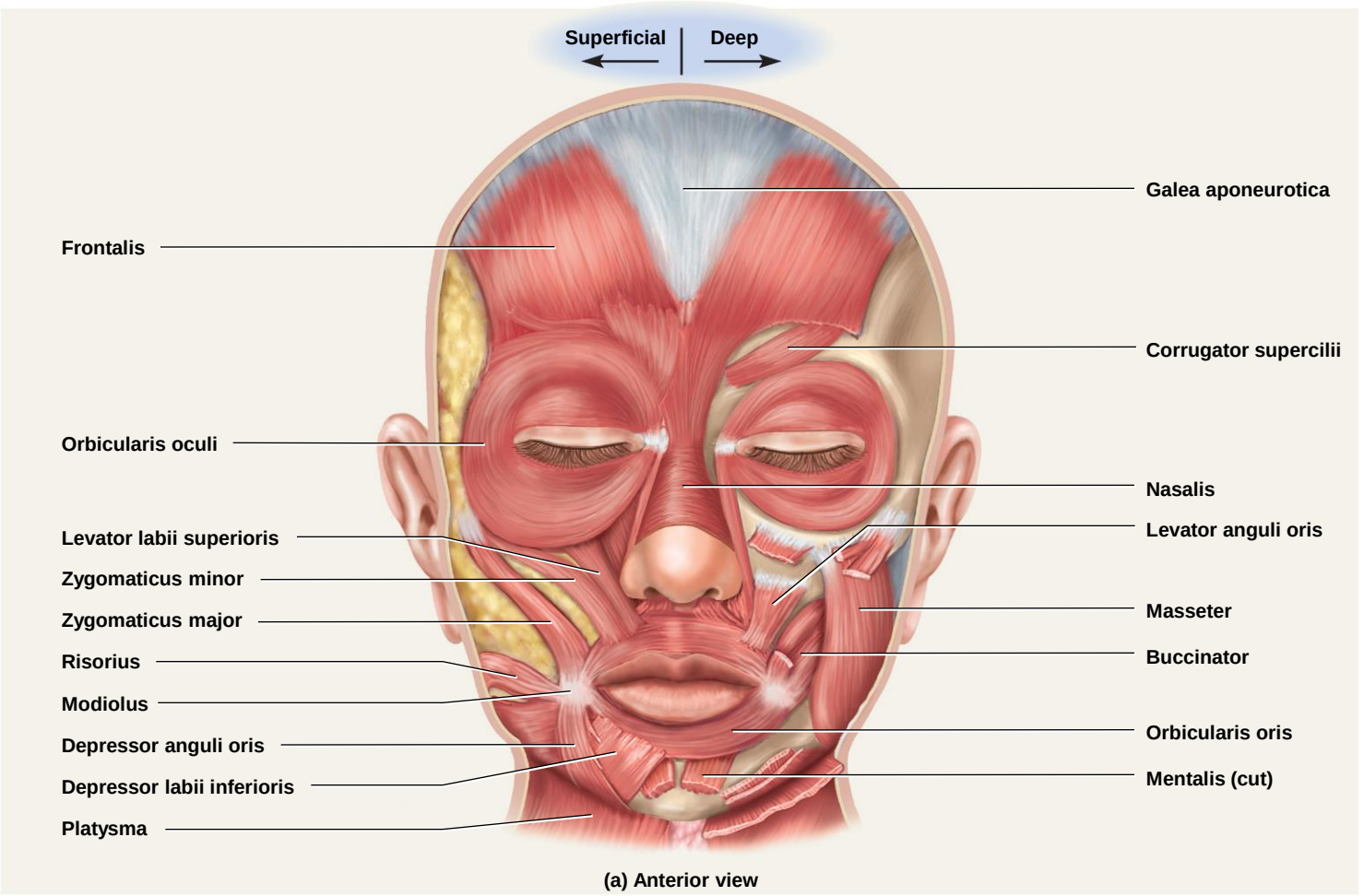

Figure 10.8a

Muscles of Facial Expression

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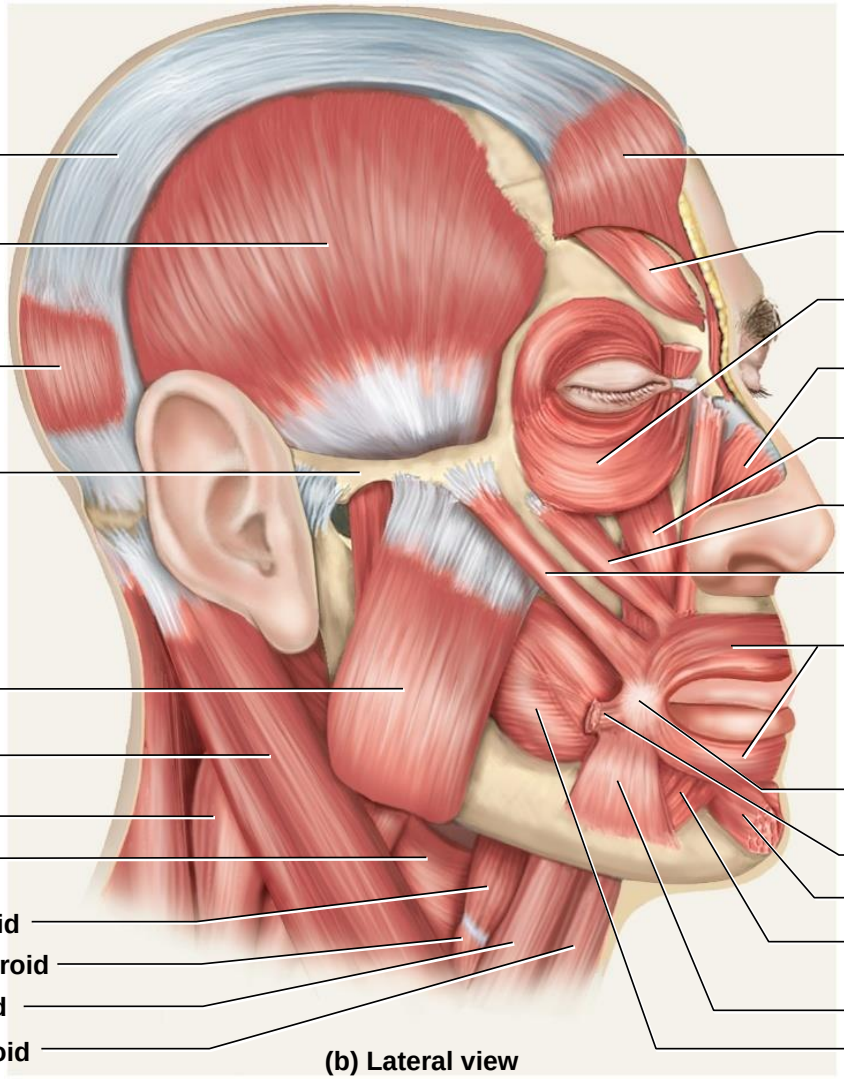

Figure 10.8b

Muscles of Chewing and Swallowing

- **Extrinsic muscles of the tongue**
  - Tongue is very agile organ
  - Pushes food between molars for chewing (mastication)
  - Forces food into the pharynx for swallowing (deglutition)
  - Crucial importance to speech
- **Intrinsic muscles of tongue**
  - Vertical, transverse, and longitudinal fascicles

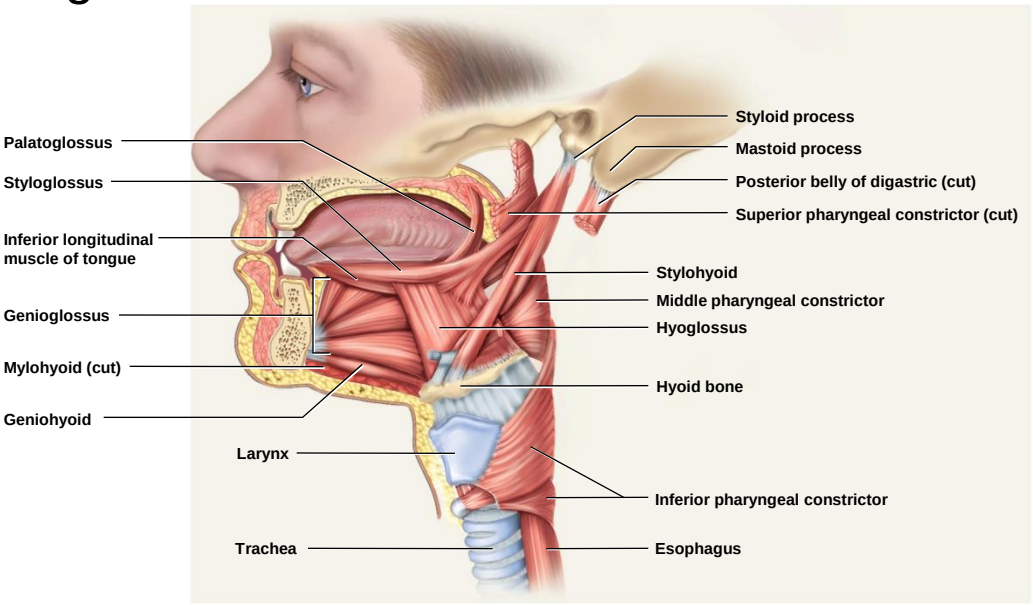

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Figure 10.9

Muscles of Chewing and Swallowing

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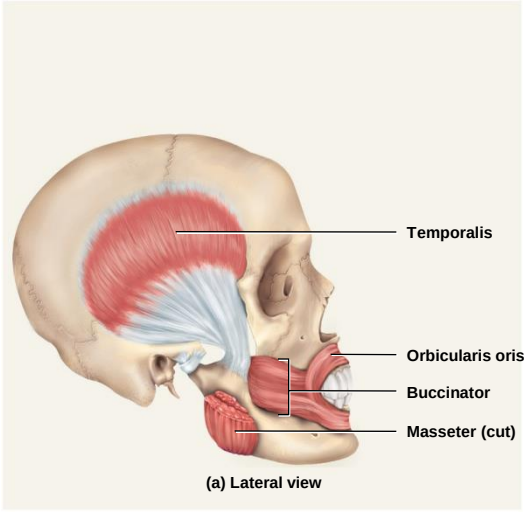
- **Four pairs of muscles produce biting and chewing movements of the mandible**
  - Depression: to open mouth
  - Elevation: biting and grinding
  - Protraction: incisors can cut
  - Retraction: make rear teeth meet
  - Lateral and medial excursion: grind food
- **Temporalis, masseter, medial pterygoid,** and **lateral pterygoid**
- **Innervated by mandibular nerve, a branch of the trigeminal (CN V)**



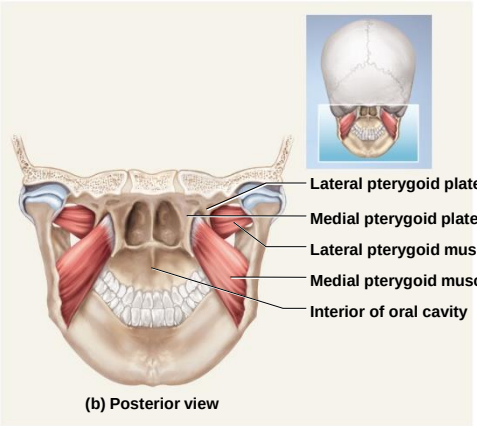


Figure 10.10a,b

Muscles of Chewing and Swallowing

- **Hyoid muscles—suprahyoid group**
- **Aspects of chewing, swallowing, and vocalizing**
- **Eight pairs of hyoid muscles associated with hyoid bone**
- **Digastric**—opens mouth widely
- **Geniohyoid**—depresses mandible
- **Mylohyoid**—elevates floor of mouth at beginning of swallowing
- **Stylohyoid**—elevates hyoid

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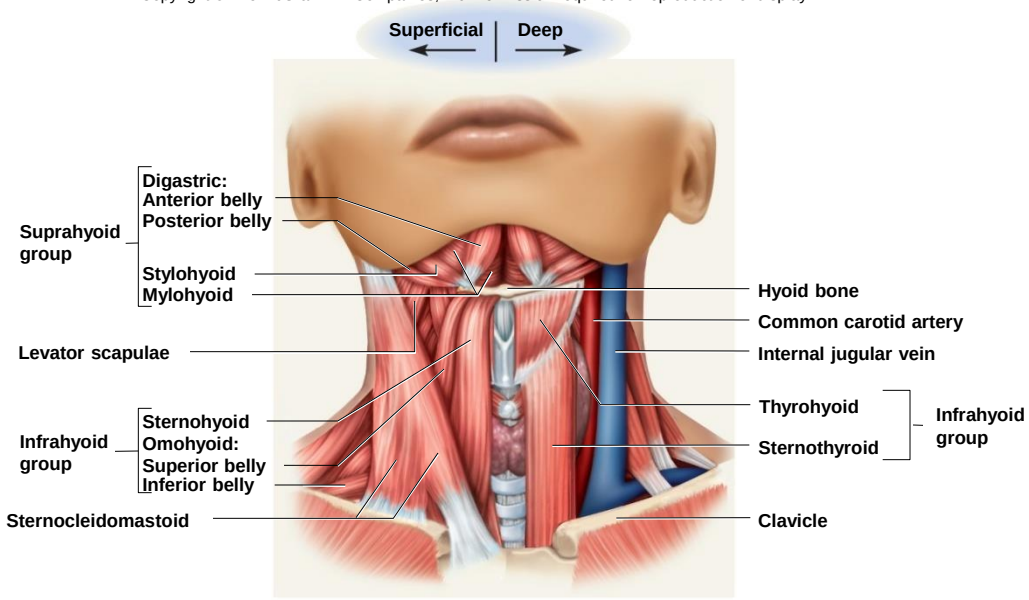

(a) Anterior view

Figure 10.11a

Muscles of Chewing and Swallowing

- **Hyoid muscles—infrahyoid group**
- **Fix hyoid bone from below, allowing suprahyoid muscles to open mouth**
- **Omohyoid—**depresses hyoid after elevation
- **Sternohyoid—**depresses hyoid after elevation
- **Thyrohyoid—**depresses hyoid and elevates larynx
- **Sternothyroid—**depresses larynx after elevation

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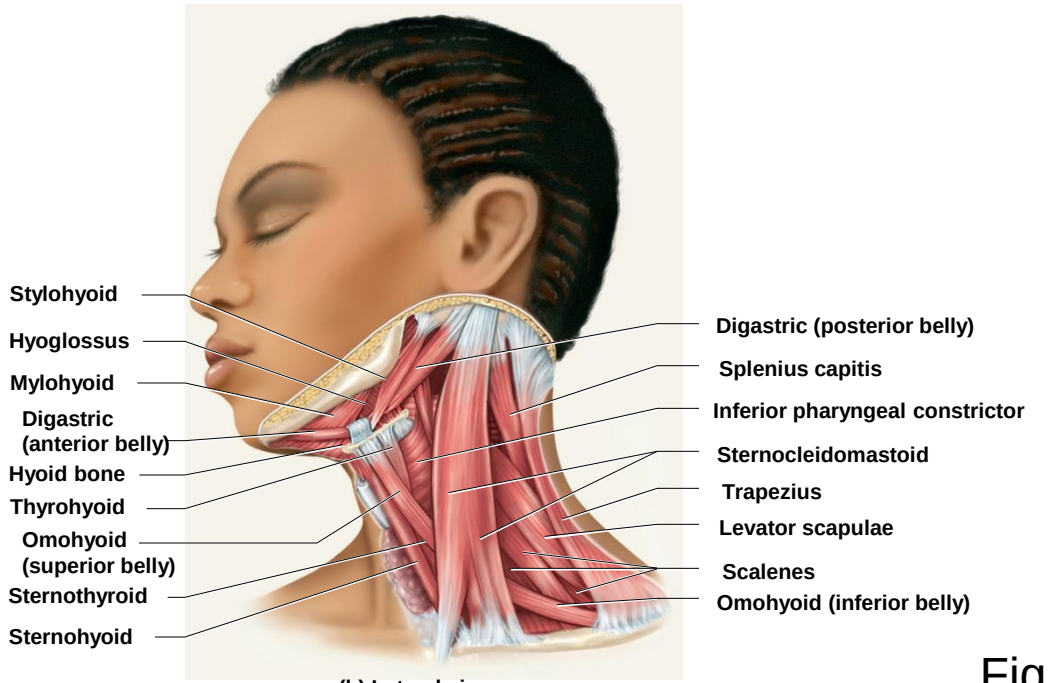

(b) Lateral view

Figure 10.11b

Muscles of Chewing and Swallowing

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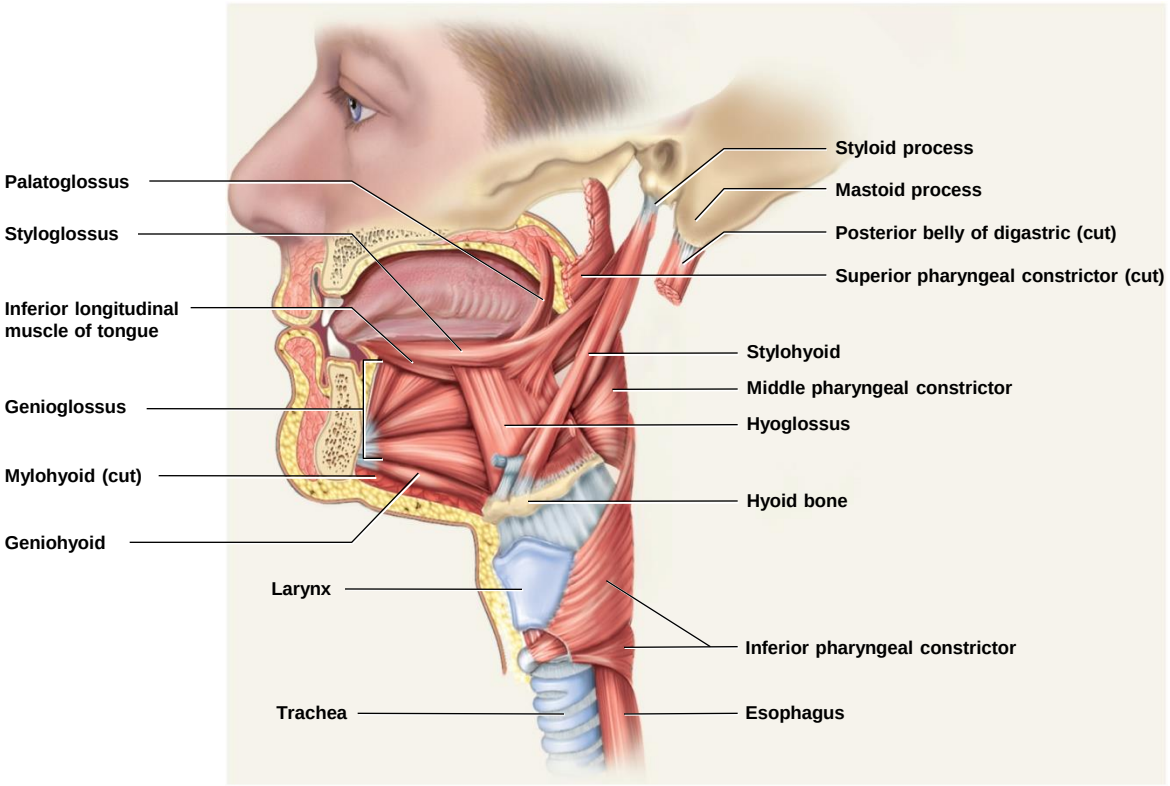

Figure 10.9

- **Pharynx:** three pairs **pharyngeal constrictors**
  - Encircle pharynx forming a muscular funnel
  - During swallowing, drive food into the esophagus

Muscles Acting on the Head

- **Originate on vertebral column, thoracic cage, and pectoral girdle**
- **Insert on the cranial bones**
- **Actions**
  - Flexion (tipping head forward)
  - Extension (holding the head erect)
  - Lateral flexion (tipping head to one side)
  - Rotation (turning the head to the left and right)

Muscles Acting on the Head

- **Neck flexors**
  - **Sternocleidomastoid**
  - **Scalenes**
- **Neck extensors**
  - **Trapezius**
  - **Splenius capitis**
  - **Semispinalis capitis**

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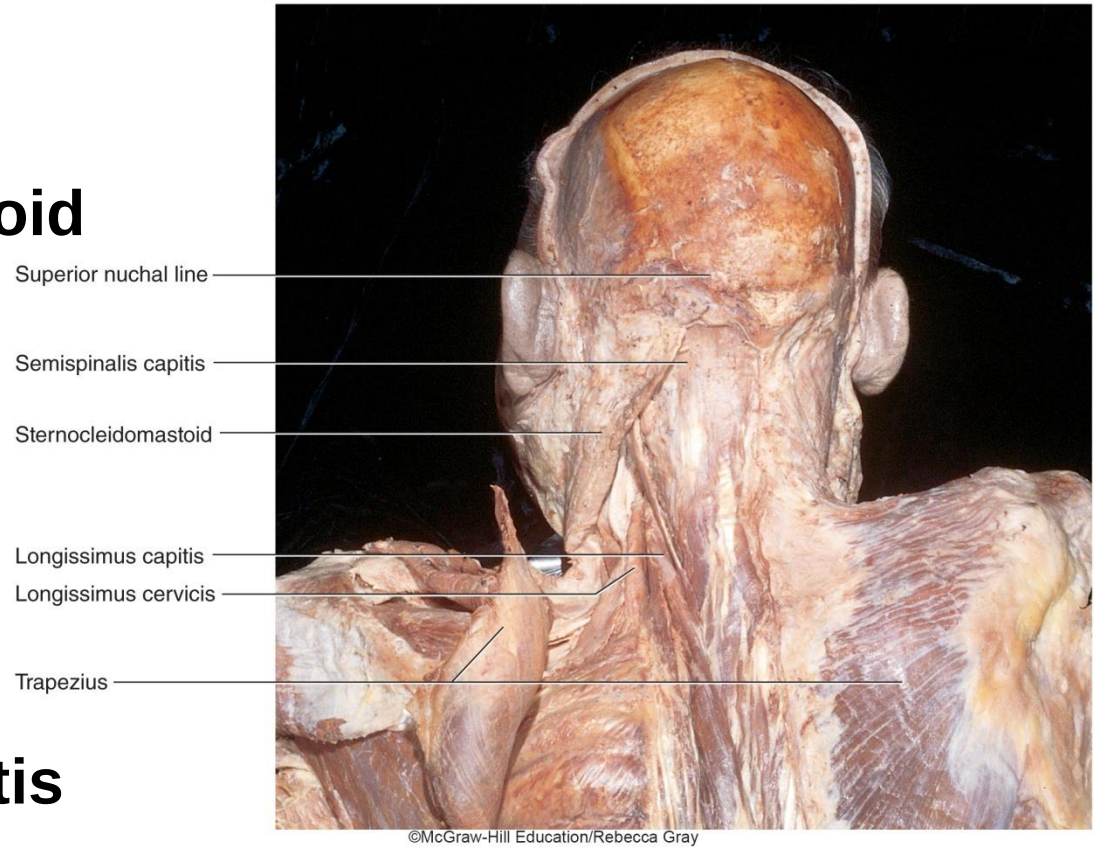

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Figure 10.12

Muscles Acting on the Head

- **May cause contralateral movement: movement of the head toward the opposite side**
- **May cause ipsilateral movement: movement of the head toward the same side**

Muscles of the Trunk

- **Expected Learning Outcomes**
  - Name and locate the muscles of respiration and explain how they affect airflow and abdominal pressure.
  - Name and locate the muscles of the abdominal wall, back, and pelvic floor.
  - Identify the origin, insertion, action, and innervation of any of these muscles.

Muscles of the Trunk

- **Three functional groups**
  - Muscles of respiration
  - Muscles that support abdominal wall and pelvic floor
  - Movement of vertebral column

Muscles of Respiration

- **Breathing requires the use of muscles enclosing thoracic cavity**
  - **Diaphragm, external intercostal, internal intercostal,** and **innermost intercostal muscles**
- **Inspiration—**air intake
- **Expiration—**expelling air

Muscles of Respiration

- **Other muscles of chest and abdomen that contribute to breathing**
  - **Sternocleidomastoid, scalenes of neck**
  - **Pectoralis major** and **serratus anterior of chest**
  - **Latissimus dorsi of back**
  - Abdominal muscles: **internal and external obliques,** and **transverse abdominis**
  - Even some anal muscles

Muscles of Respiration

- **Diaphragm**—muscular dome between thoracic and abdominal cavities
- Muscle fascicles extend to a fibrous **central tendon**
- **Contraction** flattens diaphragm
  - Enlarges thoracic cavity (inspiration)
- In **relaxation** of diaphragm it rises
  - Shrinks the thoracic cavity (expiration)

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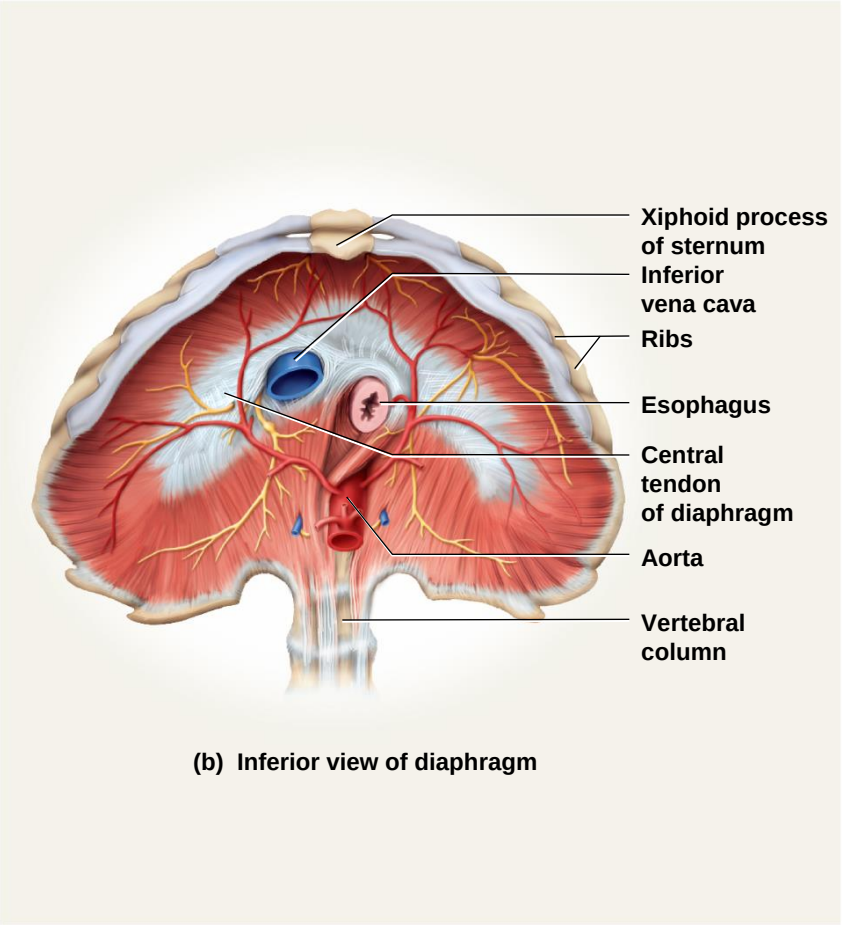

Figure 10.13b

Muscles of Respiration

- **External intercostals**
  - Elevate ribs
  - Expand thoracic cavity
  - Create partial vacuum causing inflow of air
- **Internal intercostals**
  - Depresses and retracts ribs
  - Compresses thoracic cavity
  - Expelling air
- **Innermost intercostals**
  - Same action as internal intercostals

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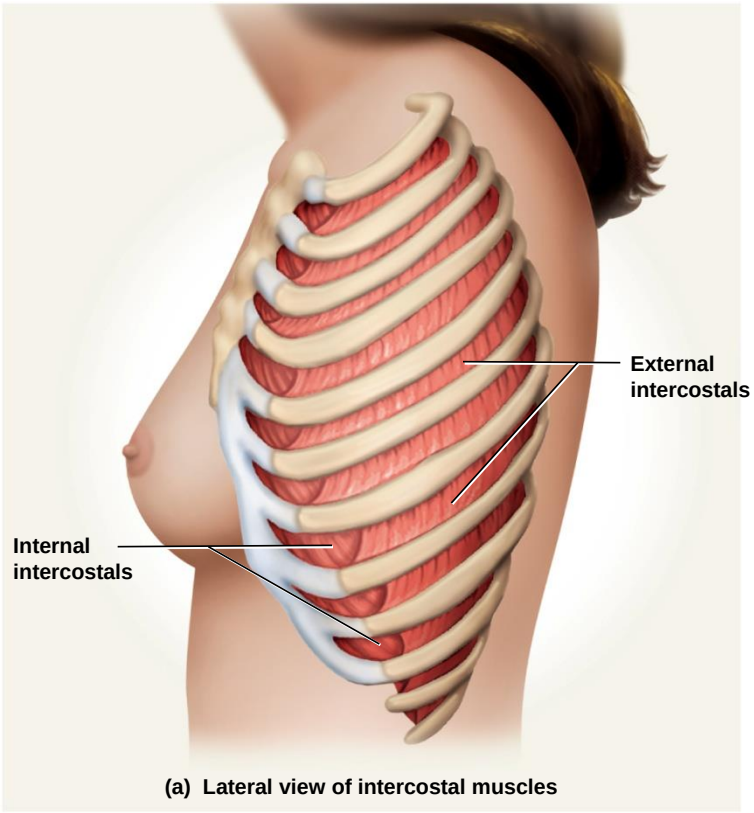

Figure 10.13a

Muscles of the Anterior Abdominal Wall

- **Internal abdominal oblique**
  - Intermediate layer of lateral abdominal muscles
  - Unilateral contraction causes ipsilateral rotation of waist
  - Aponeurosis
    - Tendons of oblique and transverse muscles
    - Broad, fibrous sheets

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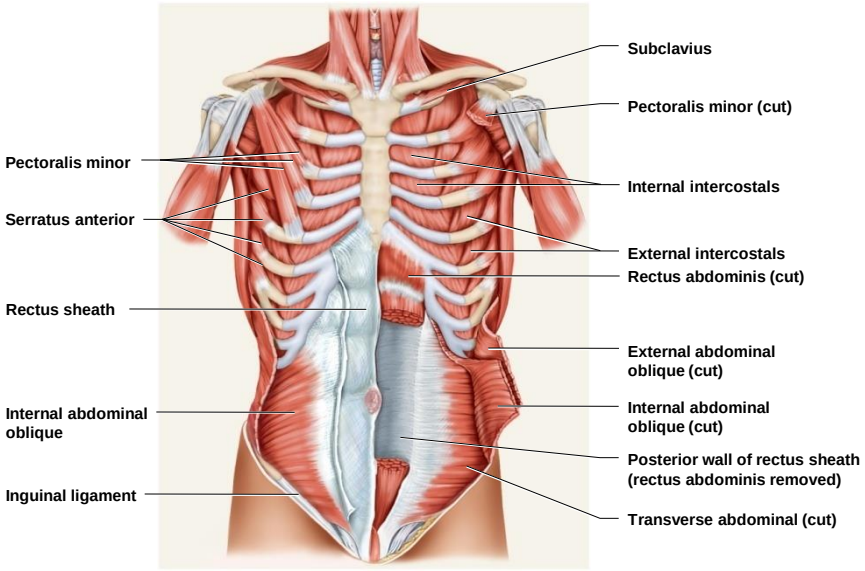

Figure 10.15b

Muscles of the Anterior Abdominal Wall

- **Transverse abdominal**
  - Deepest of lateral abdominal muscles
  - Horizontal fibers
  - Compresses abdominal contents
  - Contributes to movements of vertebral column

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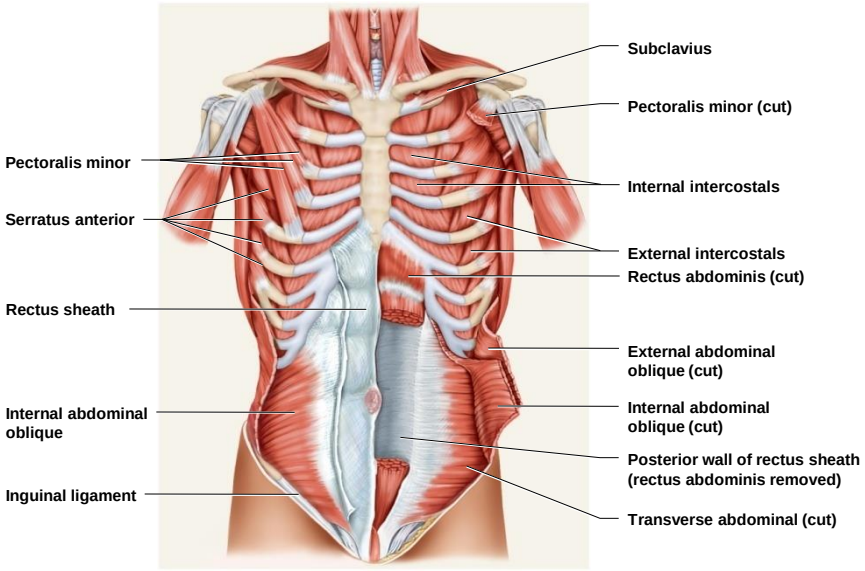

(b) Deep

Figure 10.15b

Muscles of the Anterior Abdominal Wall

- **Rectus abdominis**
  - Flexes lumbar region of vertebral column
  - Produces forward bending at the waist
  - Extends from sternum to pubis
  - Rectus sheath encloses muscle
  - Three transverse tendinous intersections divide rectus abdominis into segments, sometimes called a “six pack”

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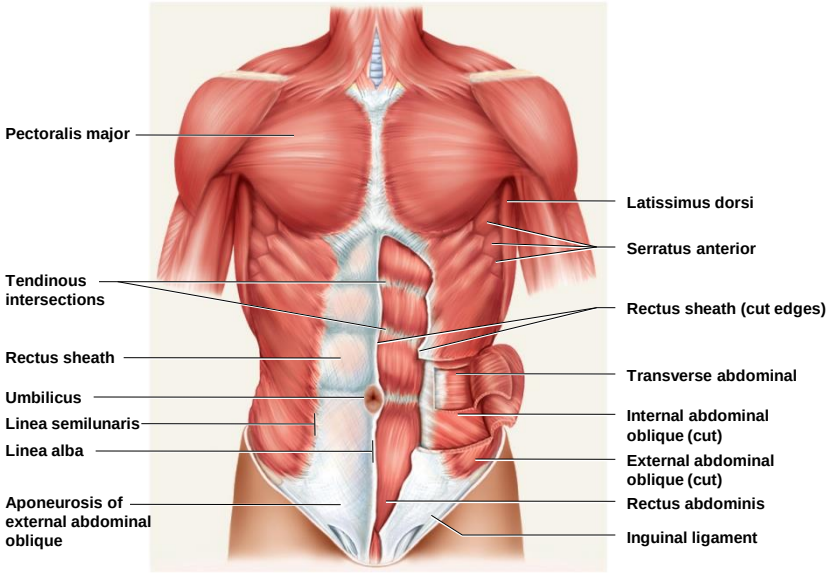

Figure 10.15a

Muscles of Back

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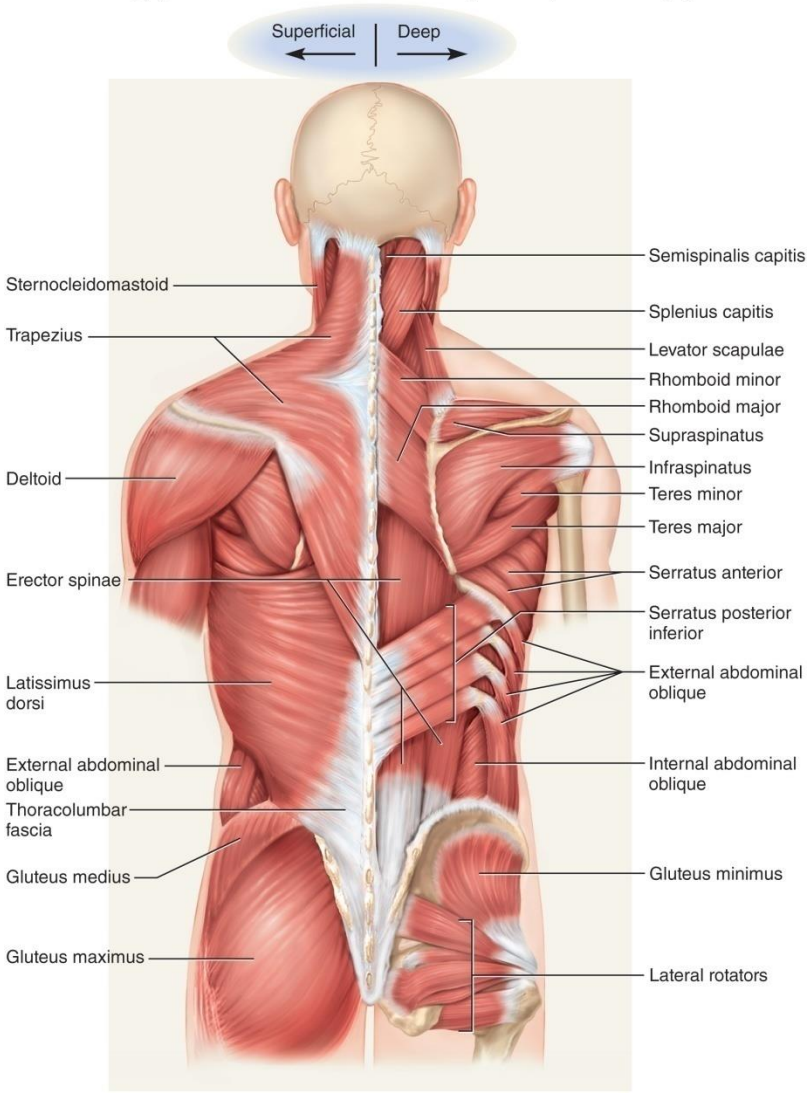

Figure 10.17

- Back muscles extend, rotate, and laterally flex vertebral column
- Most prominent superficial back muscles: latissimus dorsi and trapezius
- Upper limb movement

Muscles of the Back

- **Deep muscles**
- **Erector spinae**
  - **Iliocostalis, longissimus, spinalis**
  - From cranium to sacrum
  - Extension and lateral flexion of vertebral column
- **Semispinalis thoracis**
  - Extension and contralateral rotation of vertebral column

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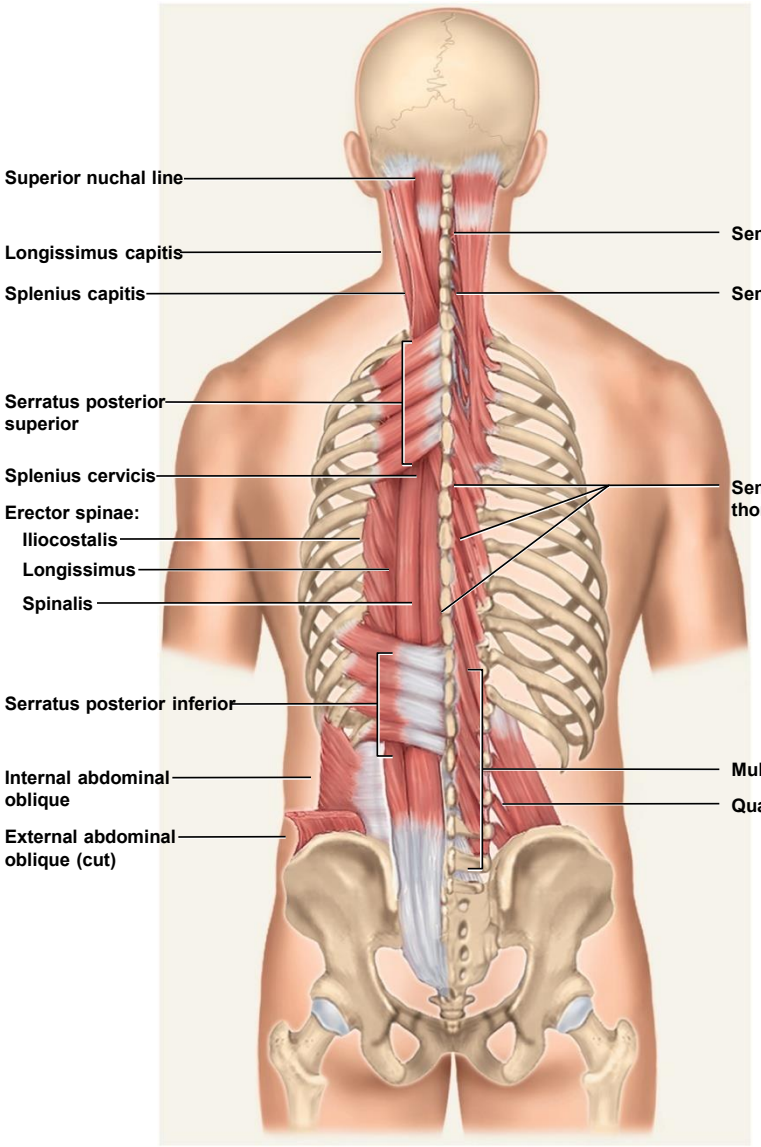

Figure 10.18

Muscles of the Back

(Continued)

- **Quadratus lumborum**
  - Aids respiration
  - Ipsilateral flexion of lumbar vertebral column

- **Multifidus**
  - Stabilizes adjacent vertebrae
  - Maintains posture

Muscles of the Pelvic Floor

- **Layers of muscles and fasciae that span pelvic outlet**
  - Penetrated by anal canal, urethra, and vagina
- **Perineum**—diamond-shaped region between the thighs
  - Bordered by four bony landmarks
    - Pubic symphysis anteriorly
    - Coccyx posteriorly
    - Ischial tuberosities laterally
  - Urogenital triangle: anterior half of perineum
  - Anal triangle: posterior half of perineum

Muscles of the Pelvic Floor

- **Layers or compartments of the perineum**
  - Superficial perineal space
    - **Ischiocavernosus, bulbospongiosus**
  - Deep perineal space
    - **Deep transverse perineal, compressor urethrae**
  - Anal triangle
    - **External anal sphincter**
  - Pelvic diaphragm: deepest (most superior) layer
    - **Levator ani**

Muscles of the Pelvic Floor

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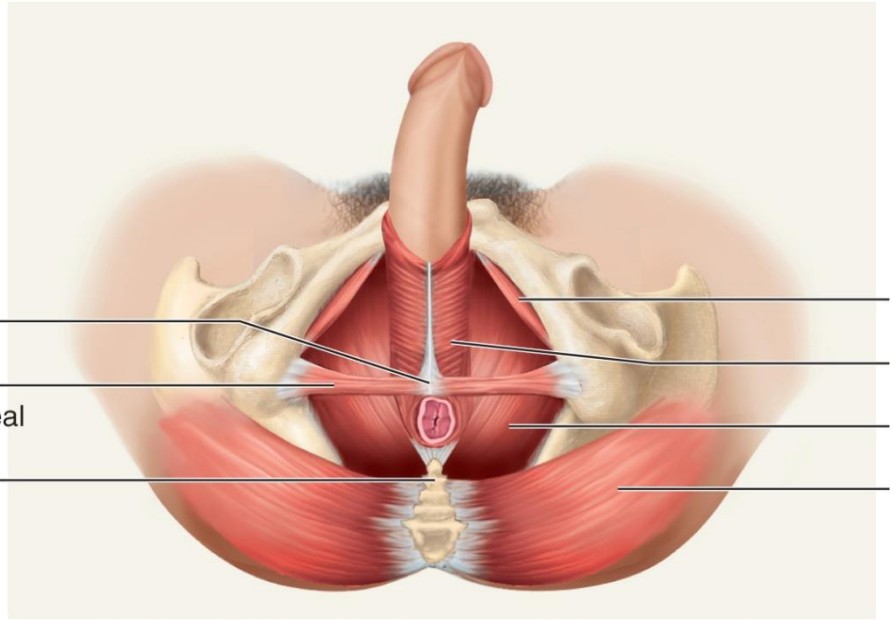

(a) Superficial perineal space, inferior view, male

Figure 10.20a

- **Superficial perineal space**
  - **Ischiocavernosus**—maintains erection
  - **Bulbospongiosus**—aids in erection, expels remaining urine

Muscles of the Pelvic Floor

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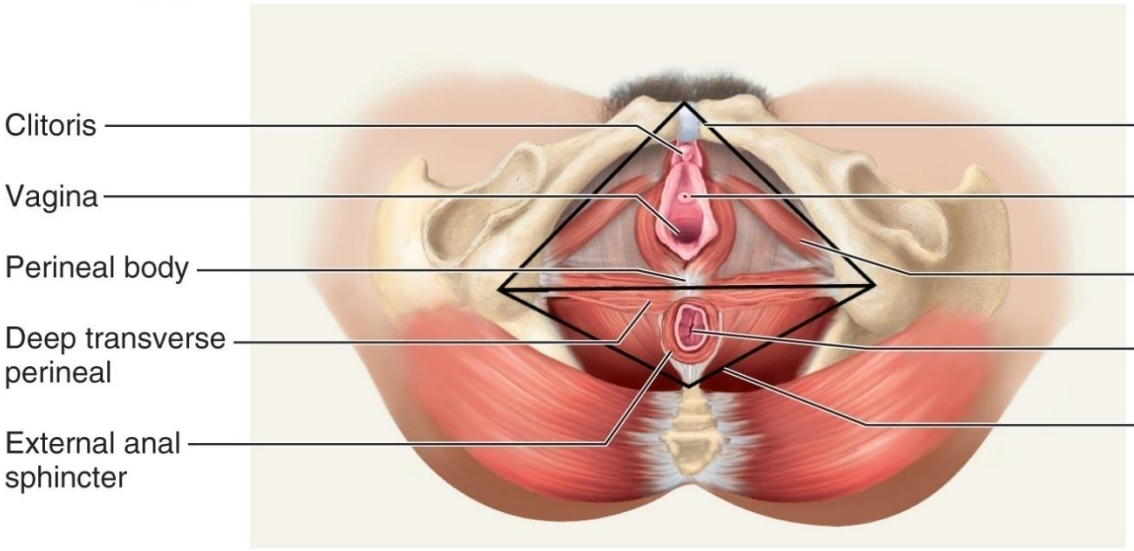
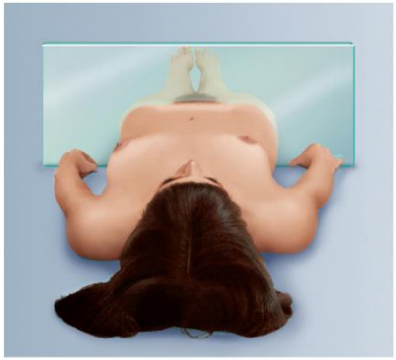


(b) Deep perineal space, inferior view, female

Figure 10.20b

- **Deep perineal space**
  - **Urogenital triangle**—contains **deep transverse perineal muscle** and **compressor urethrae in females**
- **Anal triangle—external anal sphincter**

Muscles of the Pelvic Floor



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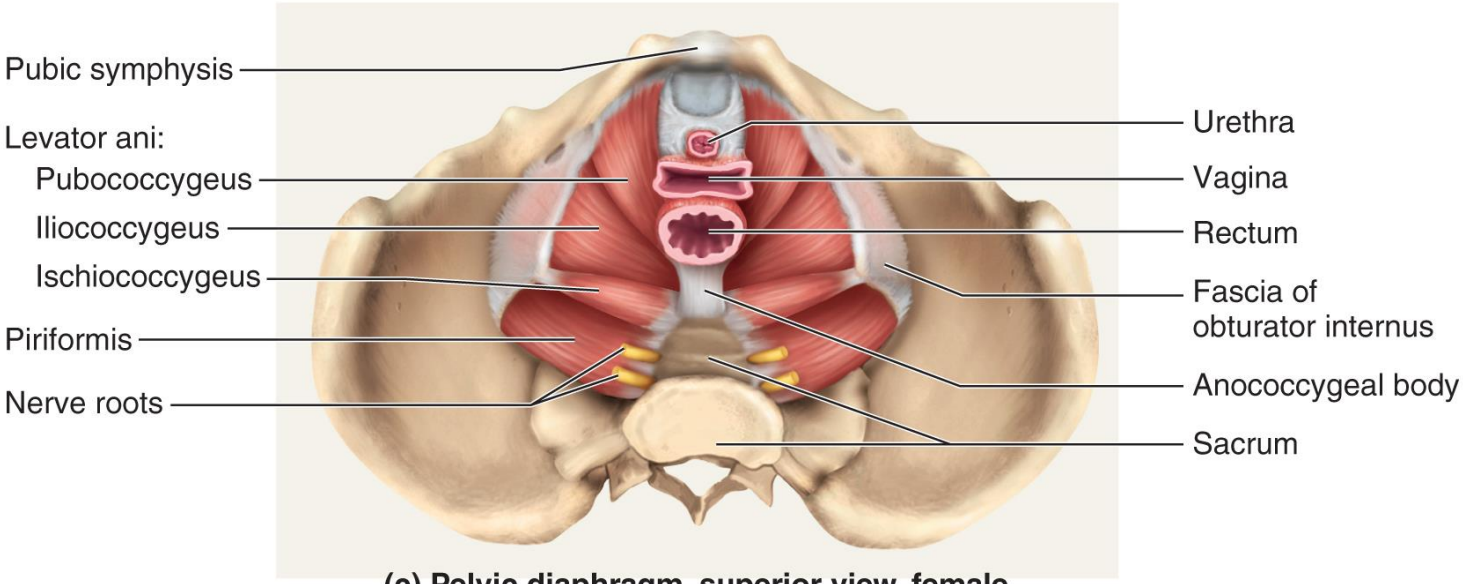

(c) Pelvic diaphragm, superior view, female

Figure 10.20c

- **Pelvic diaphragm**: deepest compartment of the perineum
  - **Levator ani:** supports viscera and defecation
  - Coccygeus muscle(s)

Hernias

- **Hernia—**any condition in which the viscera protrudes through a weak point in the muscular wall of the abdominopelvic cavity
- **Inguinal hernia**
  - Most common type of hernia (rare in women)
  - Viscera enter inguinal canal or even the scrotum
- **Hiatal hernia**
  - Stomach protrudes through diaphragm into thorax
  - Overweight people over 40
- **Umbilical hernia**
  - Viscera protrude through the navel

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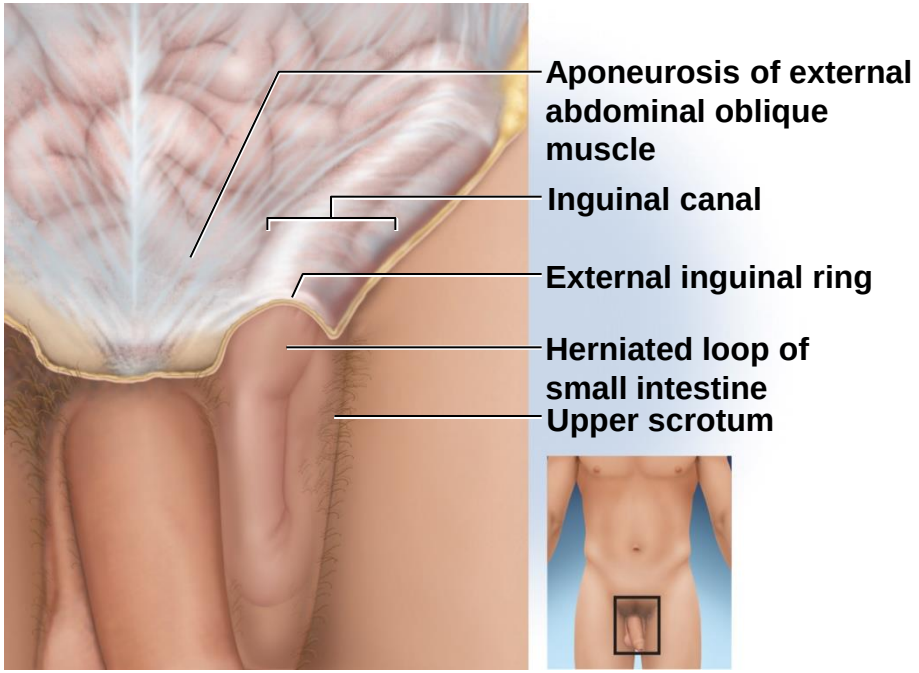

Figure 10.21

Muscles Acting on the Shoulder and Upper Limb

- **Expected Learning Outcomes**
  - Name and locate the muscles that act on the pectoral girdle, shoulder, elbow, wrist, and hand.
  - Relate the actions of these muscles to the joint movements described in chapter 9.
  - Describe the origin, insertion, and innervation of each muscle.

Muscles Acting on the Shoulder and Upper Limb

- Compartments—spaces where muscles are separated by fibrous connective tissue sheets (fasciae)
  - Each compartment contains one or more functionally related muscles along with their nerve and blood supplies
- Muscles of upper limbs divided into anterior and posterior compartments
- Intermuscular septa (thick fascia) separates compartments
- Compartment syndrome—one of the muscles or blood vessels in a compartment is injured

Compartment Syndrome

- **If a blood vessel in a compartment is damaged, blood and tissue fluid accumulate**
- **Fasciae enclose muscle compartments snugly and prevent expansion**
- **Compartment syndrome—mounting pressure triggers a sequence of degenerative events**
  - Blood flow to compartment is obstructed by pressure
  - If ischemia (poor blood flow) persists for more than 2 to 4 hours, nerves begin to die
  - After 6 hours, muscles begin to die
- **Nerves can regenerate after pressure relieved, but muscle damage is permanent**
- **Myoglobin in urine indicates compartment syndrome**
- **Treatment: immobilization of limb and fasciotomy (incision to relieve compartment pressure)**

Muscles Acting on the Shoulder and Upper Limb

- **Upper limb is used for a broad range of powerful and subtle actions**
  - Climbing, grasping, throwing, writing, playing musical instruments, and manipulating small objects
- **Muscles that act on the scapula**
- **Muscles that act on the humerus and shoulder joint**
- **Muscles that act on the forearm and elbow joint**
- **Muscles that act on the wrist, hand, and fingers**

Muscles Acting on the Shoulder

- **A group of muscles originate on the axial skeleton and insert on clavicle or scapula**
- **Scapula loosely attached to thoracic cage**
  - Capable of great movement
  - Rotation, elevation, depression, protraction, retraction
- **Clavicle braces the shoulder and moderates movements**

Muscles Acting on the Scapula

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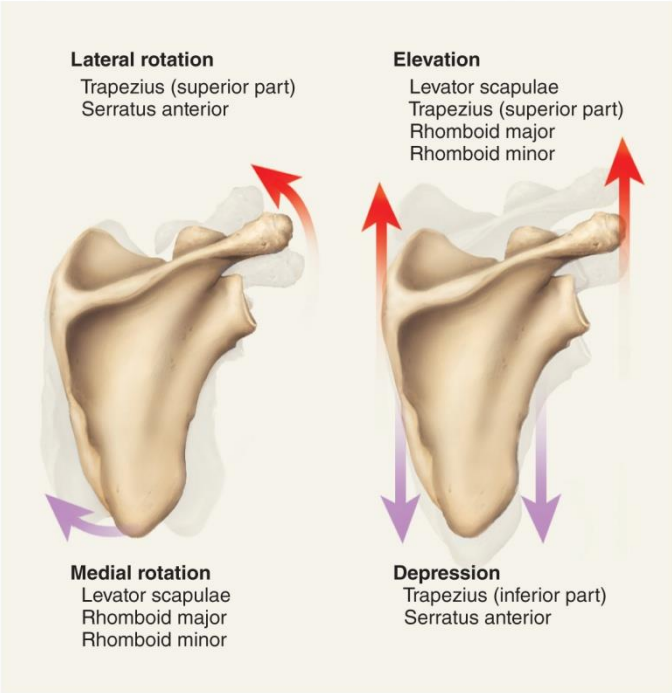

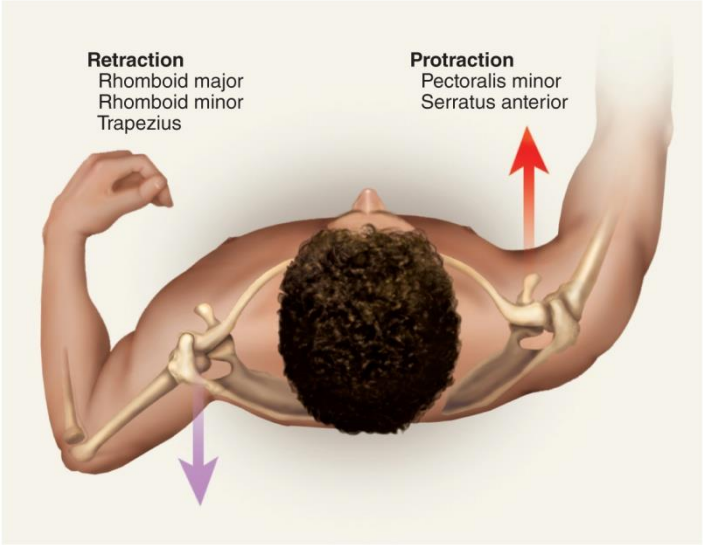

Figure 10.22

Muscles Acting on the Shoulder

- **Anterior group of muscles of pectoral girdle**
- **Pectoralis minor**
  - Ribs 3–5 to coracoid process of scapula
  - Draws scapula laterally
- **Serratus anterior**
  - All ribs to medial border of scapula
  - Draws scapula laterally and forward; prime mover for reaching and pushing

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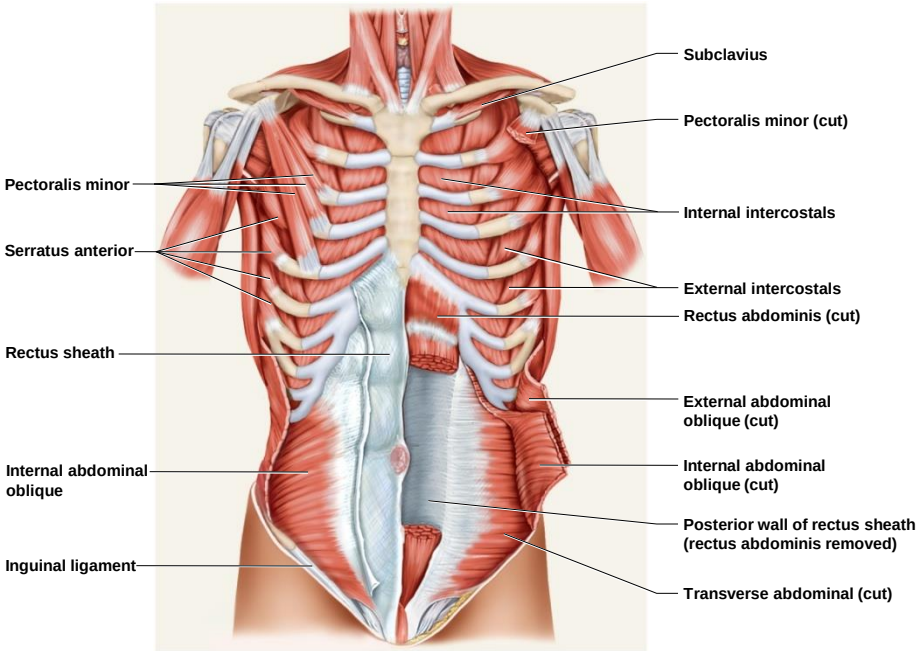

Figure 10.15b

Muscles Acting on the Shoulder

- **Posterior group of muscles of pectoral girdle**

- **Four muscles of posterior group**
  - **Trapezius:** superficial
  - **Levator scapulae, Rhomboid minor,** and **Rhomboid major:** deep

- **Trapezius**
  - Stabilizes scapula and shoulder
  - Elevates and depresses shoulder apex

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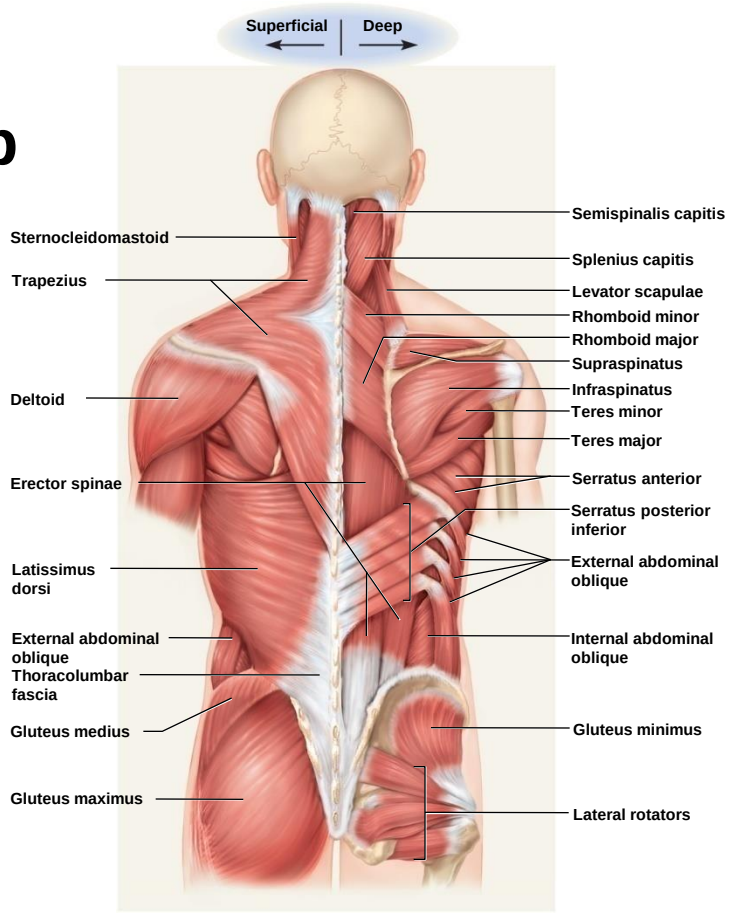

Figure 10.17

Muscles Acting on the Shoulder

(***Continued from slide 170***)

- **Levator scapulae**
  - Elevates scapula
  - Flexes neck laterally

- **Rhomboid minor**
  - Retracts scapula and braces shoulder

- **Rhomboid major**
  - Same as Rhomboid minor

Muscles Acting on the Shoulder

- **Posterior scapular muscles**

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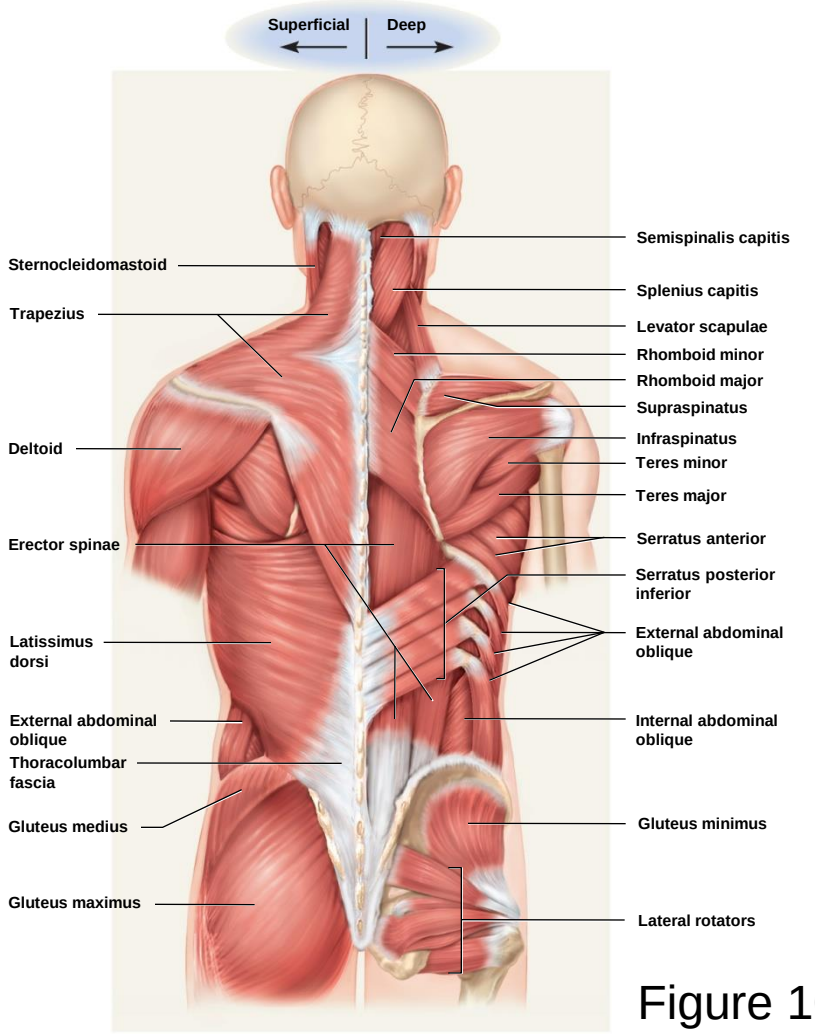

Figure 10.17

Muscles Acting on the Arm

- **Nine muscles cross the shoulder joint and insert on humerus**
- **Two are axial muscles originating on axial skeleton**
  - **Pectoralis major:** flexes, adducts, and medially rotates humerus
  - **Latissimus dorsi:** adducts and medially rotates humerus

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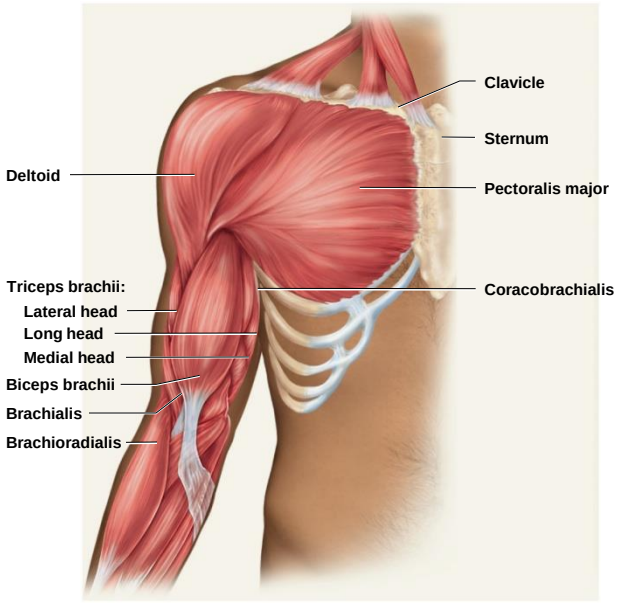

(a) Anterior view

Figure 10.23a

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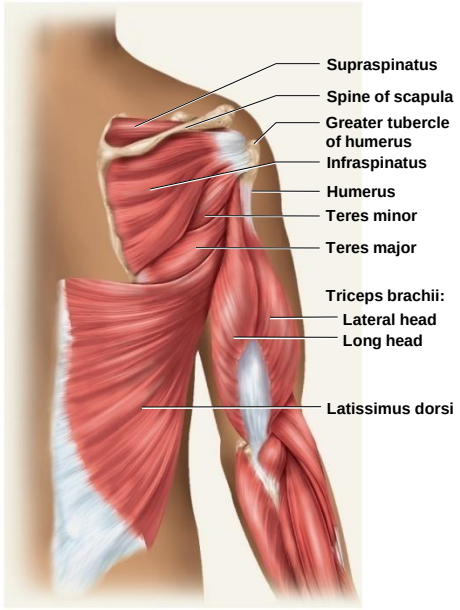

(b) Posterior view

Figure 10.23b

Anterior View of Cadaver Chest

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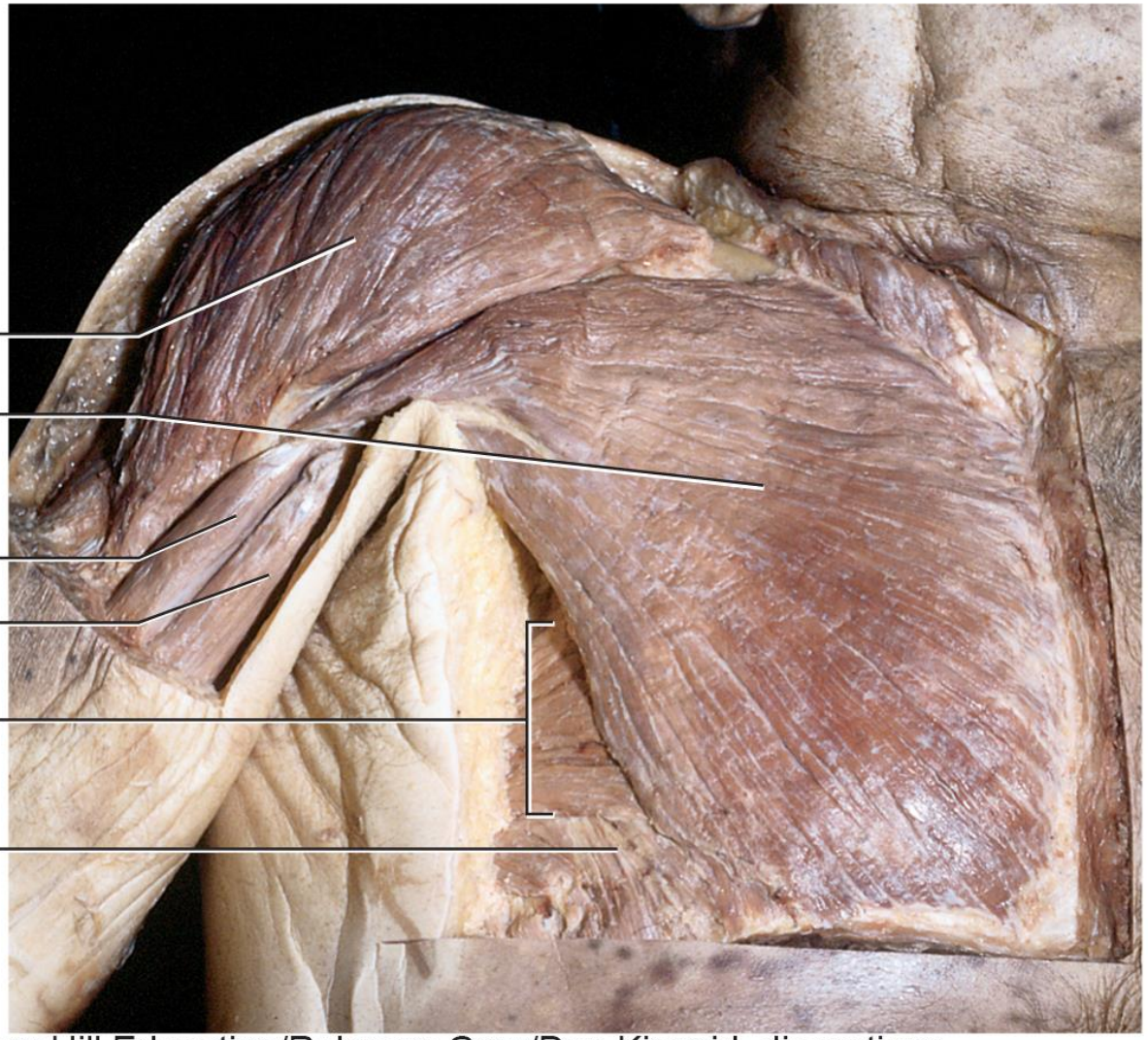

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Figure 10.24a

Back Muscles of Cadaver

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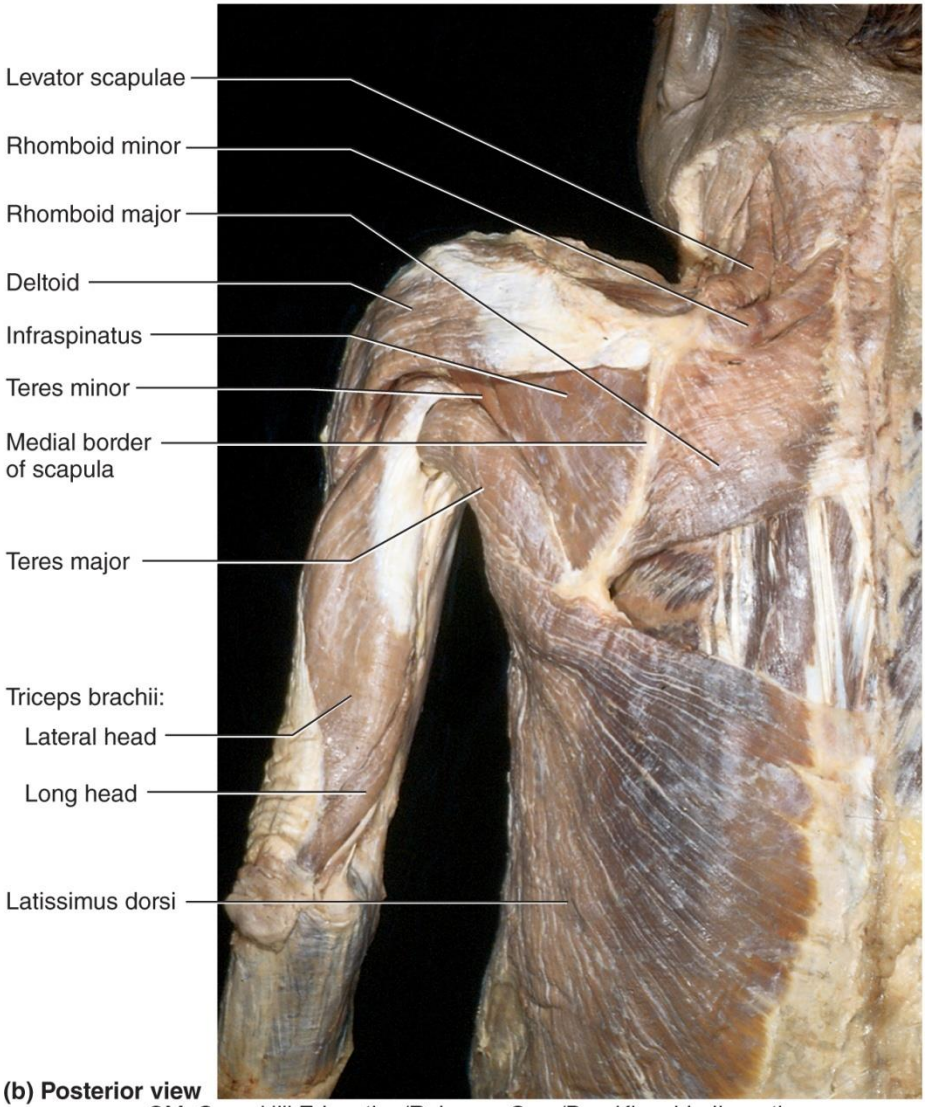

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Figure 10.24b

Muscles Acting on the Arm

- **Seven muscles with scapular origin**
  - **Deltoid**
    - Rotates and abducts arm
    - Intramuscular injection site
  - **Teres major**
    - Extension and medial rotation of humerus
  - **Coracobrachialis**
    - Flexes and medially rotates arm
  - **Remaining four form the rotator cuff that reinforce the shoulder joint**

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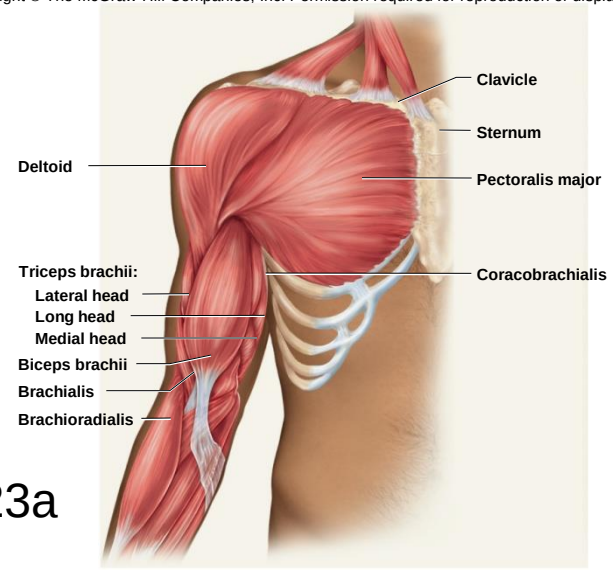

Figure 10.23a

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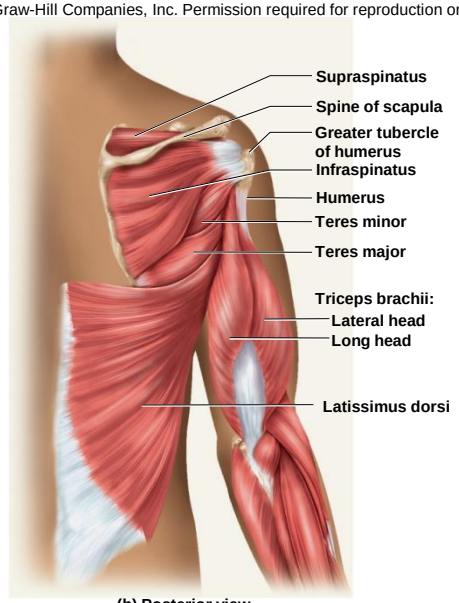

Figure 10.23b

Muscles Acting on the Arm

- **Rotator cuff muscles**
- **Tendons of the remaining four scapular muscles form the rotator cuff**
- **Acronym “SITS muscles”**
  - ***S*upraspinatus**
  - ***I*nfraspinatus**
  - ***T*eres minor**
  - ***S*ubscapularis**
- **Tendons of these muscles merge with the joint capsule of the shoulder as they cross it in route to the humerus**
- **Holds head of humerus into glenoid cavity**
- **Supraspinatus tendon easily damaged**

Rotator Cuff Muscles

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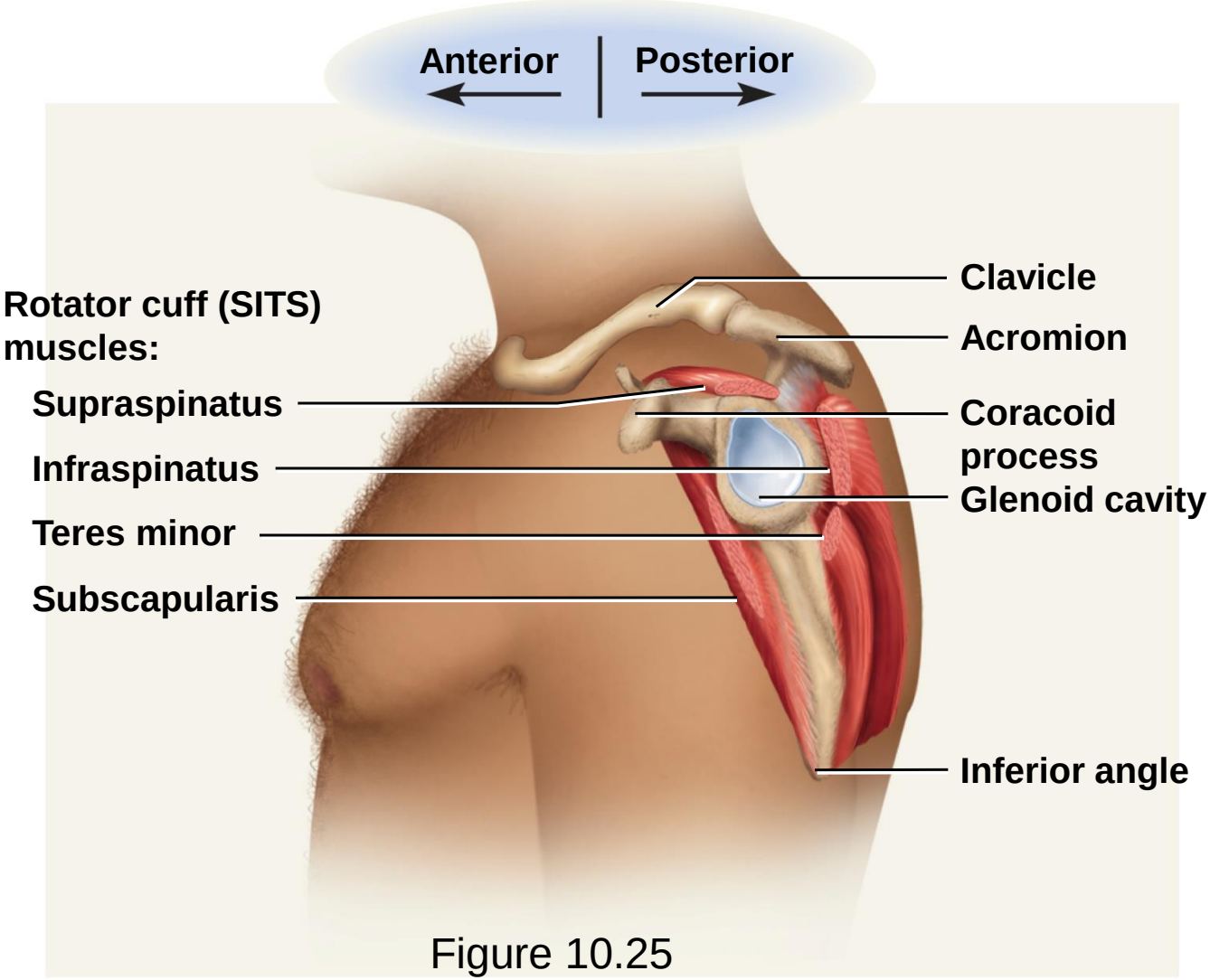

Figure 10.25

Muscles Acting on the Forearm

- **Elbow and forearm capable of flexion, extension, pronation, and supination**
  - Carried out by muscles in both brachium (arm) and antebrachium (forearm)
- **Muscles with bellies in the arm (brachium)**
  - Principal elbow flexors: anterior compartment
    - **Brachialis** and **biceps brachii**
      - Brachialis produces 50% more power than biceps brachii
      - Brachialis is prime mover of elbow flexion
  - Principal elbow extensor: posterior compartment
    - **Triceps brachii**
      - Prime mover of elbow extension

Muscles Acting on the Forearm

- **Principal flexor**
  - **Brachialis**
- **Synergistic flexors**
  - **Biceps brachii**
  - **Brachioradialis**
- **Principal extensor**
  - **Triceps brachii**

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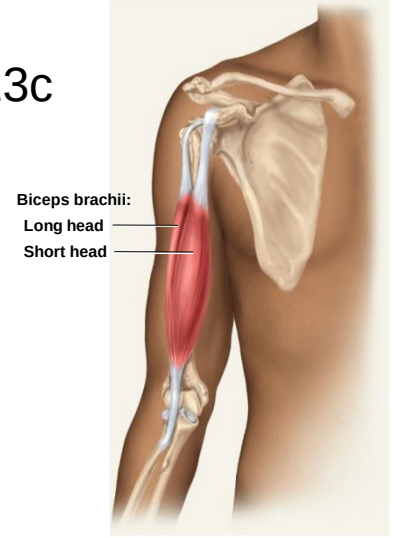
Figure 10.23c



(c) Anterior view

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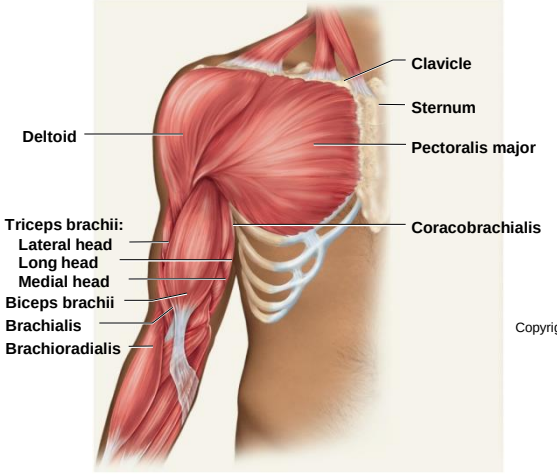

(a) Anterior view

Figure 10.23a

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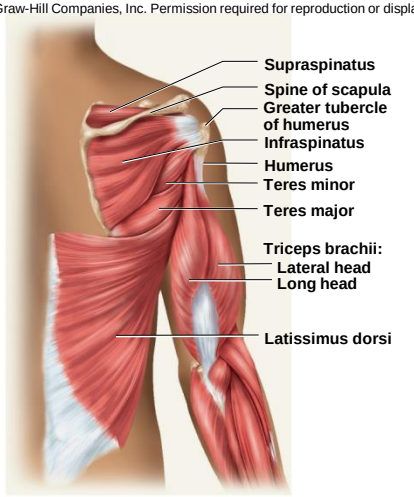

(b) Posterior view

Figure 10.23b

Muscles Acting on the Forearm

- **Muscles with bellies in the forearm (antebrachium)**
  - **Brachioradialis:** flexes elbow
  - **Anconeus:** extends elbow
  - **Pronator quadratus:** prime mover in forearm pronation
  - **Pronator teres:** assists pronator quadratus in pronation
  - **Supinator:** supinates the forearm

Muscles Acting on the Forearm

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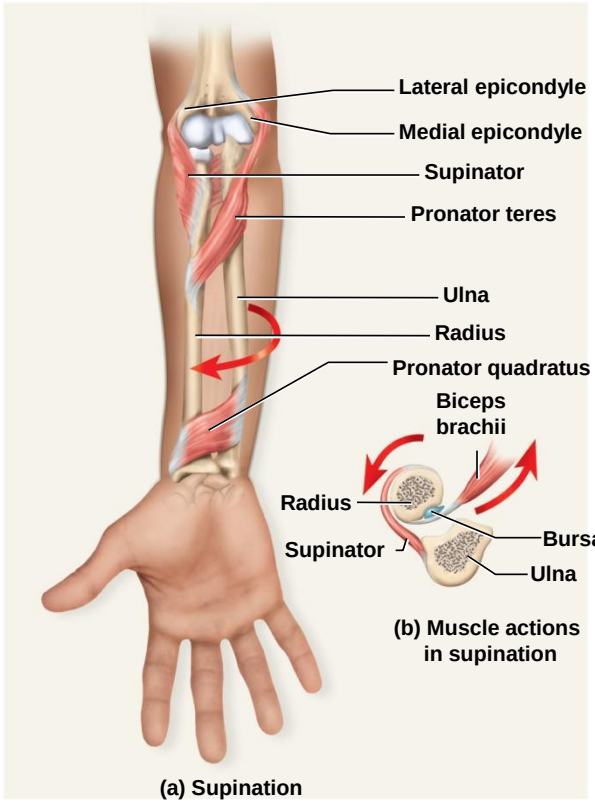

Figure 10.26a

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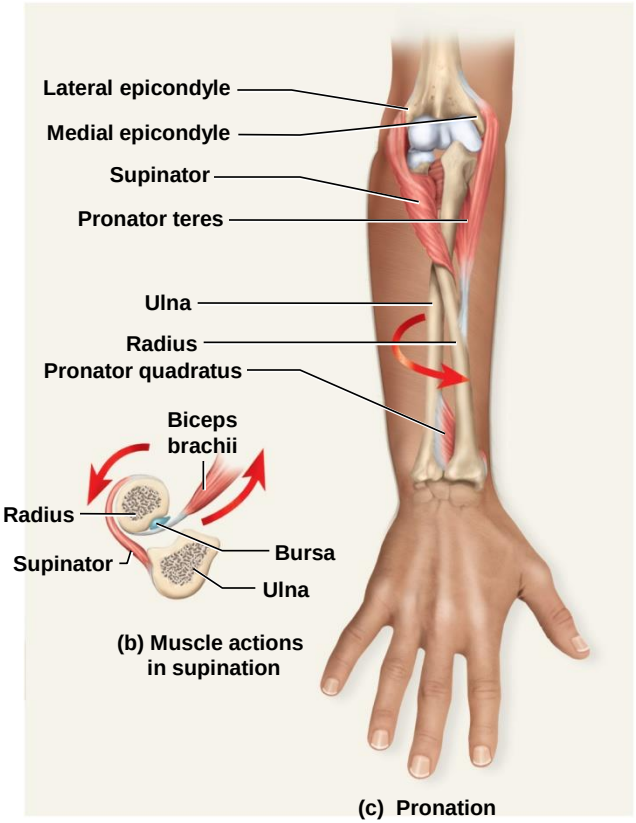

Figure 10.26c

- **Supination**
  - **Supinator** muscle
  - Palm facing anteriorly or superiorly
- **Pronation**
  - **Pronator quadratus** and **pronator teres**
  - Palm faces posteriorly or inferiorly

Muscles Acting on the Wrist and Hand

- **Anterior group**
- **Extrinsic muscles of the forearm**
- **Intrinsic muscles in the hand itself**
- **Extrinsic muscle actions**
  - Flexion and extension of wrist and digits
  - Radial and ulnar flexion
  - Finger abduction and adduction
  - Thumb opposition

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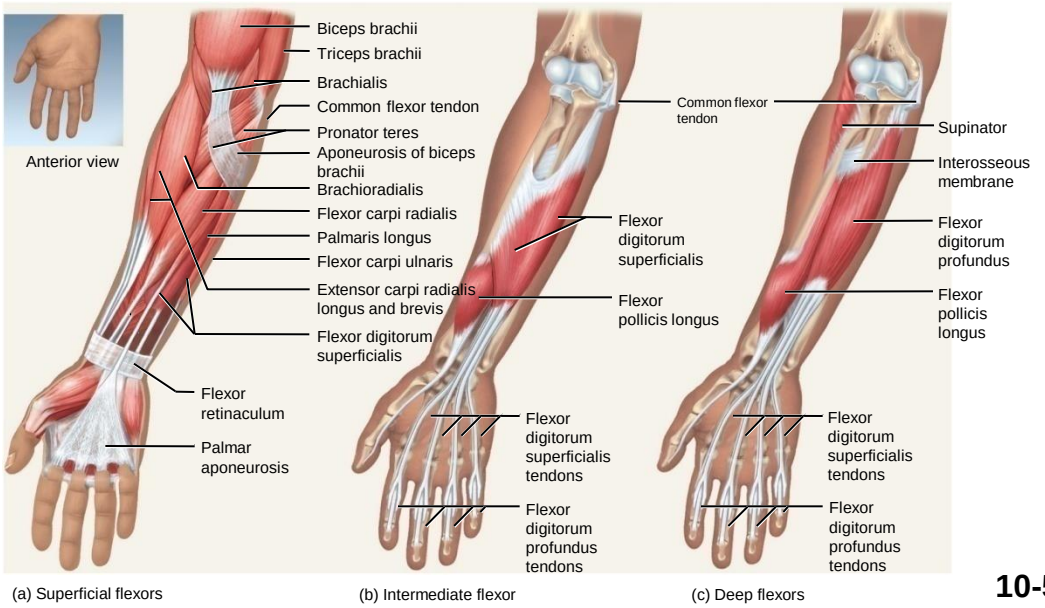

Figure 10.28a,b,c

Muscles Acting on the Wrist and Hand

- **Anterior (flexor) compartment—superficial layer**
  - **Flexor carpi radialis**
  - **Flexor carpi ulnaris**
  - **Flexor digitorum superficialis**
  - **Palmaris longus**
- **Anterior (flexor) compartment—deep layer**
  - **Flexor digitorum profundus**
  - **Flexor pollicis longus**

Cross Section of Upper Limb

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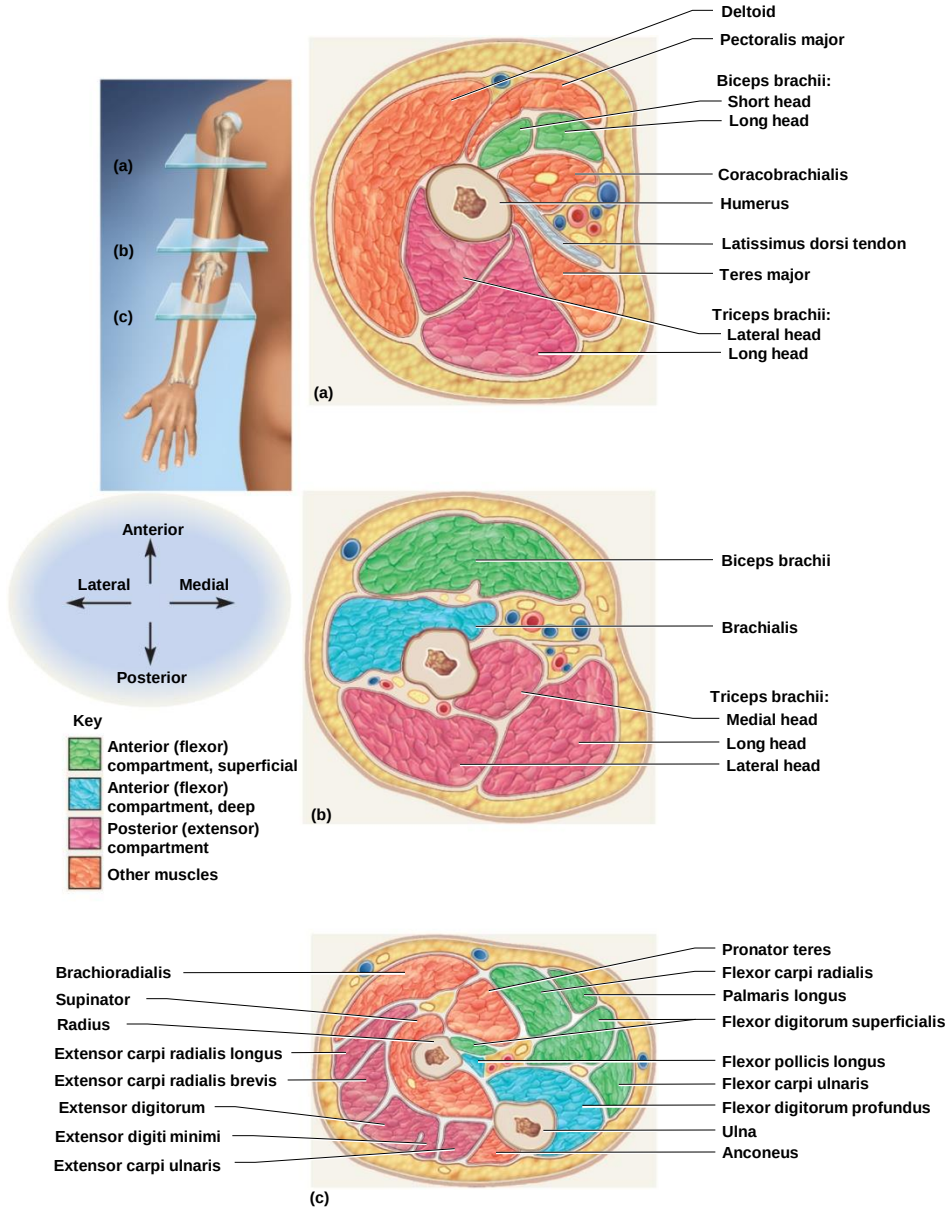

Figure 10.27a,b,c

Muscles Acting on the Wrist and Hand

- **Posterior group**
- **Extension of wrist and fingers, adduct/abduct wrist**
- **Extension and abduction of thumb (pollicis)**
- ***Brevis* means "short," *ulnaris* indicates "on ulna side of forearm"**

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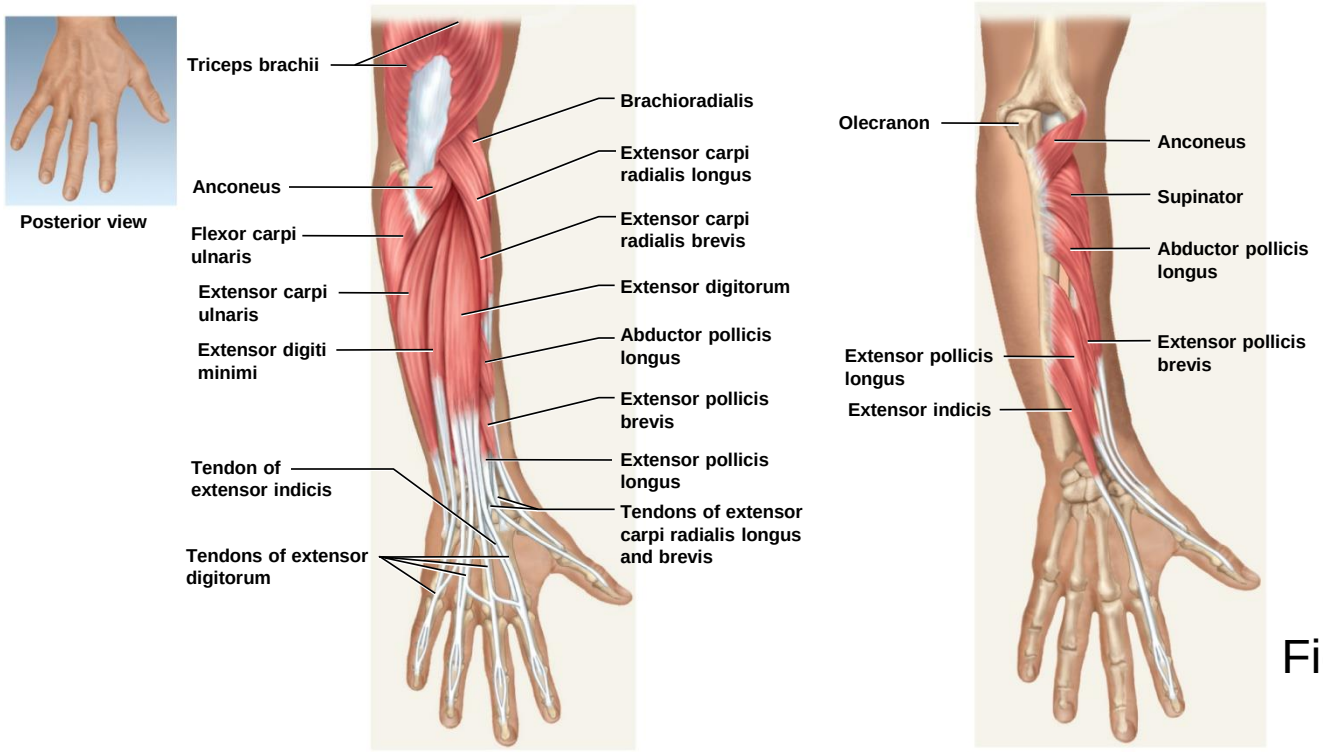

Figure 10.29a,b

Muscles Acting on the Wrist and Hand

- **Posterior (extensor) compartment—superficial layer**
  - **Extensor carpi radialis longus**
  - **Extensor carpi radialis brevis**
  - **Extensor digitorum**
  - **Extensor digiti minimi**
  - **Extensor carpi ulnaris**
- **Posterior (extensor) compartment—deep layer**
  - **Abductor pollicis longus**
  - **Extensor pollicis brevis**
  - **Extensor pollicis longus**
  - **Extensor indicis**

Carpal Tunnel Syndrome

- **Flexor retinaculum**—bracelet-like fibrous sheet, passed under by flexor tendons crossing the wrist

- **Carpal tunnel**—tight space between the flexor retinaculum and the carpal bones
  - Flexor tendons passing through the tunnel are enclosed in tendon sheaths
    - Enable tendons to slide back and forth quite easily

Carpal Tunnel Syndrome

- **Carpal tunnel syndrome**—prolonged, repetitive motions of wrist and fingers cause tissues in the carpal tunnel to become inflamed, swollen, or fibrotic
  - Puts pressure on median nerve of wrist that passes through the carpal tunnel along with flexor tendons
  - Tingling and muscular weakness in the palm and medial side of the hand
  - Pain may radiate to arm and shoulder
  - Treatment: anti-inflammatory drugs, immobilization of the wrist, and sometimes surgery to remove part or all of flexor retinaculum

Carpal Tunnel Syndrome

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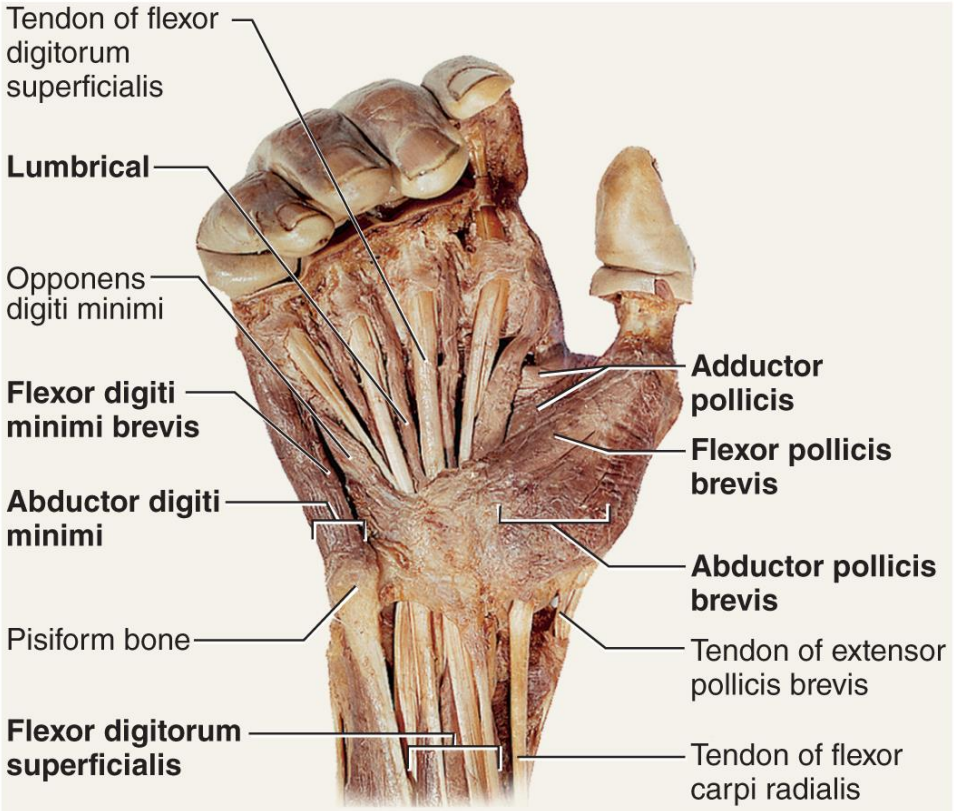

(b) Palmar dissection, superficial

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Figure 10.31b

Repetitive motions cause inflammation and pressure on median nerve

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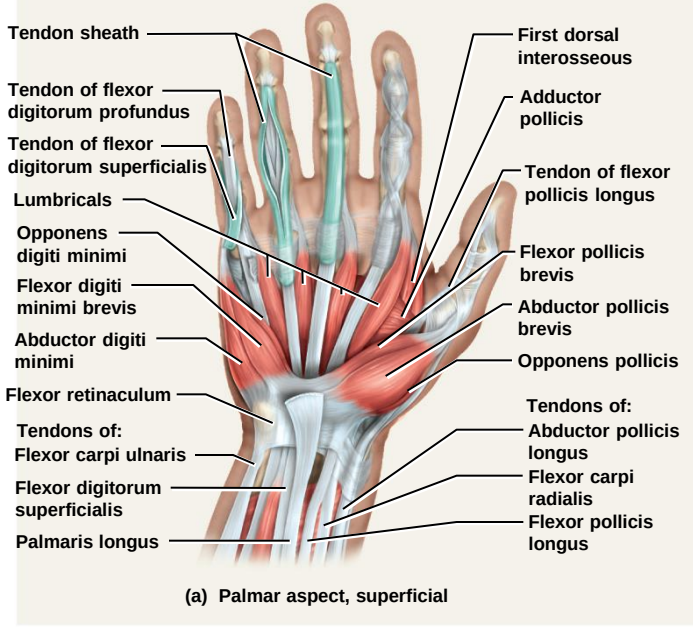

(a) Palmar aspect, superficial

Figure 10.31a

Intrinsic Muscles of the Hand

- **Thenar group—form thick, fleshy mass at base of thumb**
  - **Adductor pollicis**
  - **Abductor pollicis brevis**
  - **Flexor pollicis brevis**
  - **Opponens pollicis**
- **Hypothenar group—fleshy base of the little finger**
  - **Abductor digiti minimi**
  - **Flexor digiti minimi brevis**
  - **Opponens digiti minimi**
- **Midpalmar group—hollow of palm**
  - **Dorsal interosseous** muscles (4)
  - **Palmar interosseous** muscles (3)
  - **Lumbricals** (4 muscles)

Muscles Acting on the Hip and Lower Limb

- **Expected Learning Outcomes**
  - Name and locate the muscles that act on the hip, knee, ankle, and toe joints.
  - Relate the actions of these muscles to the joint movements described in chapter 9.
  - Describe the origin, insertion, and innervation of each muscle.

Muscles Acting on the Hip and Lower Limb

- Body's largest muscles found in lower limb
- Less for precision, more for strength needed to stand, maintain balance, walk, and run
- Several cross and act on two or more joints
- Leg—the part of the limb between the knee and ankle
- Foot—includes tarsal region (ankle), metatarsal region, and the toes

Muscles Acting on the Hip and Femur

- **Anterior muscles of the hip**
  - **Iliacus**
    - Flexes thigh at hip
    - Iliacus portion arises from iliac crest and fossa
  - **Psoas major**
    - Flexes thigh at hip
    - Arises from lumbar vertebrae
  - They share a common tendon on the femur

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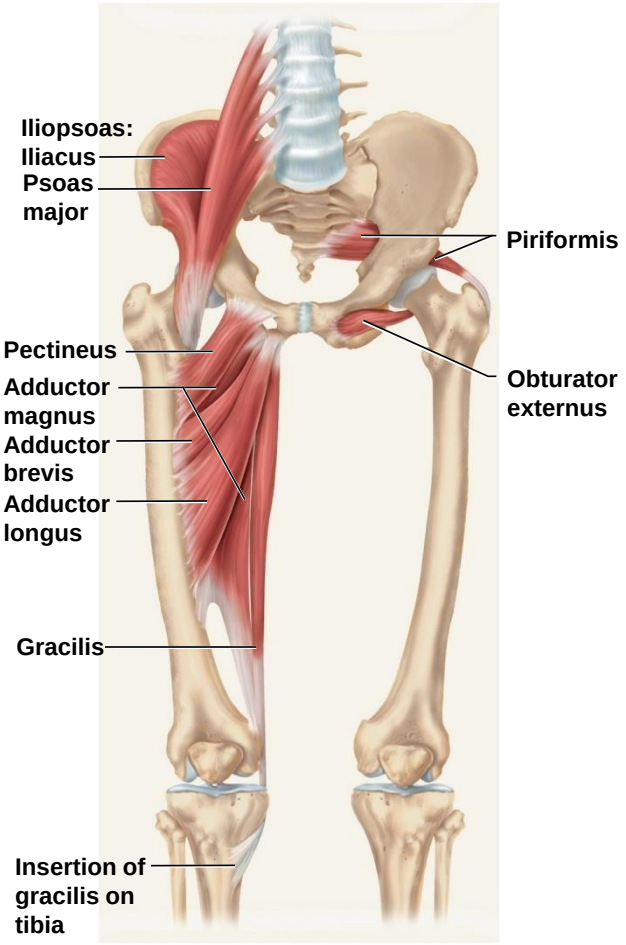

Figure 10.32

Muscles Acting on the Hip and Femur

- **Lateral and posterior muscles of the hip**
  - **Tensor fasciae latae**
    - Extends knee, laterally rotates knee
  - **Gluteus maximus**
    - Forms mass of the buttock
    - Prime hip extensor
    - Provides most of lift when you climb stairs
  - **Gluteus medius** and **minimus**
    - Abduct and medially rotate thigh

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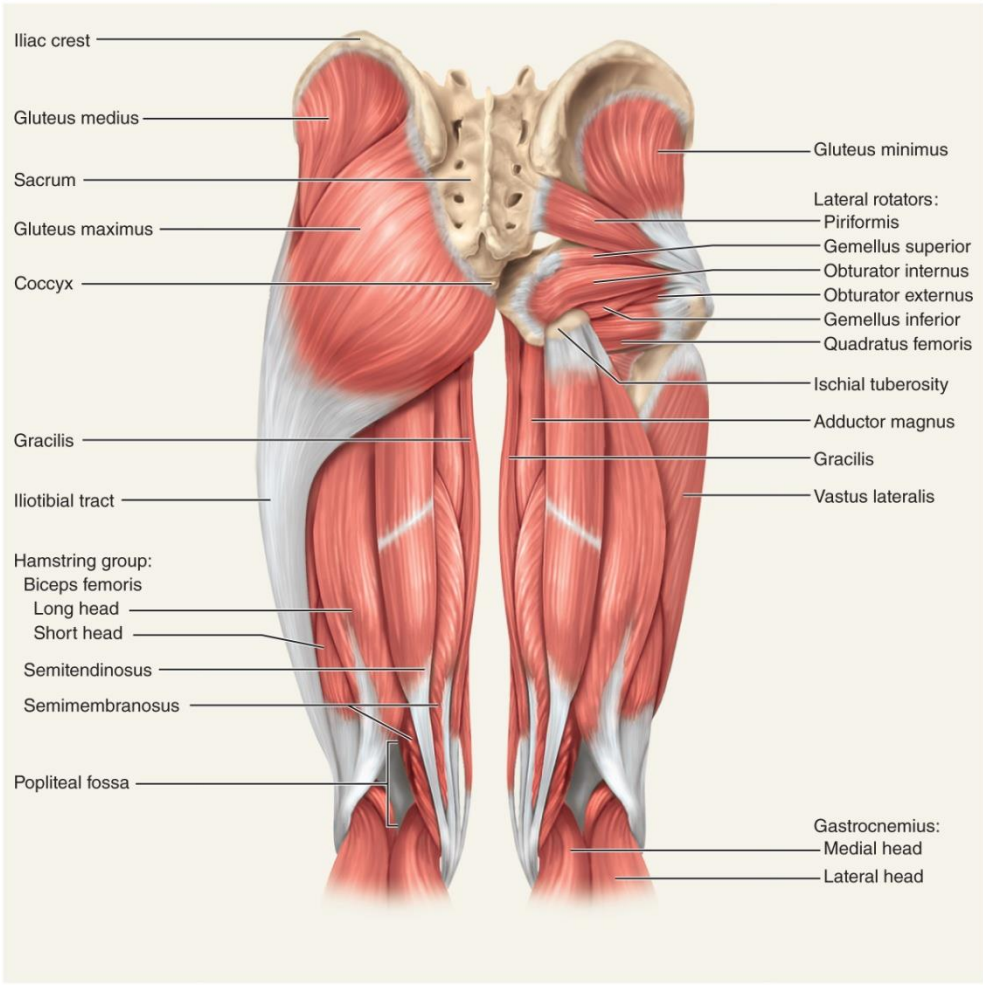

Figure 10.33

Muscles Acting on the Hip and Femur

- Posterior group
- Lateral rotators—six muscles inferior to gluteus minimus
- Deep to the two other gluteal muscles
  - Gemellus superior
  - Gemellus inferior
  - Obturator externus
  - Obturator internus
  - Piriformis
  - Quadratus femoris

Muscles Acting on the Hip and Femur

- **Medial (adductor) compartment of thigh**
- **Five muscles act as primary adductors of the thigh**
  - **Adductor brevis**
  - **Adductor longus**
  - **Adductor magnus**
  - **Gracilis**
  - **Pectineus**

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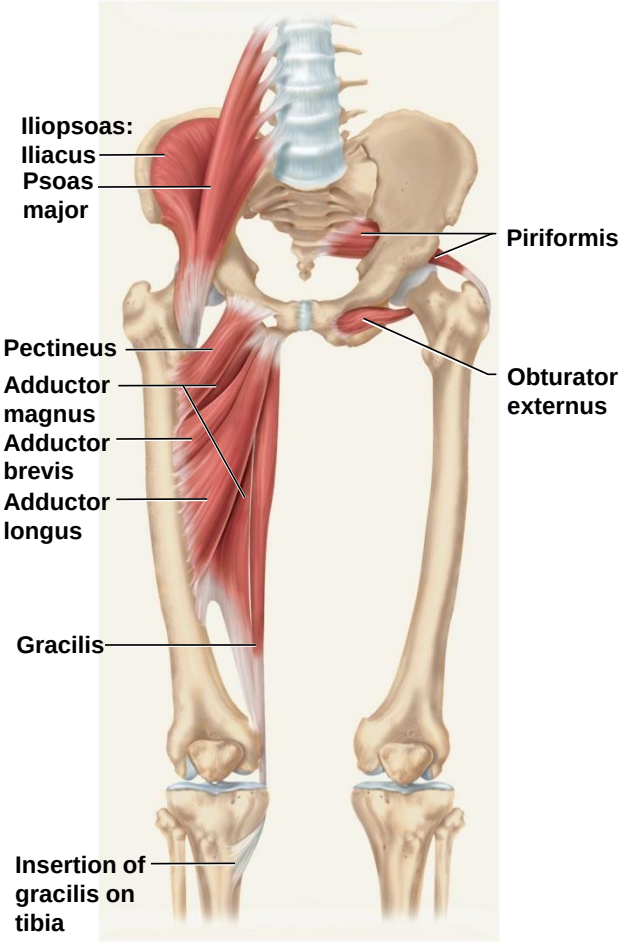

Figure 10.32

Muscles Acting on the Knee and Leg

- **Anterior (extensor) compartment of the thigh**
  - Contains large **quadriceps femoris** muscle
    - Prime mover of knee extension
    - Most powerful muscle in the body
    - Has four heads—**rectus femoris, vastus lateralis, vastus medialis,** and **vastus intermedius**
      - All converge on single quadriceps (patellar) tendon
      - Extends to patella
      - Then continues as patellar ligament
      - Inserts on tibial tuberosity
  - **Sartorius:** longest muscle in the body
    - “Tailor’s muscle”

Anterior Thigh Cadaver Muscles

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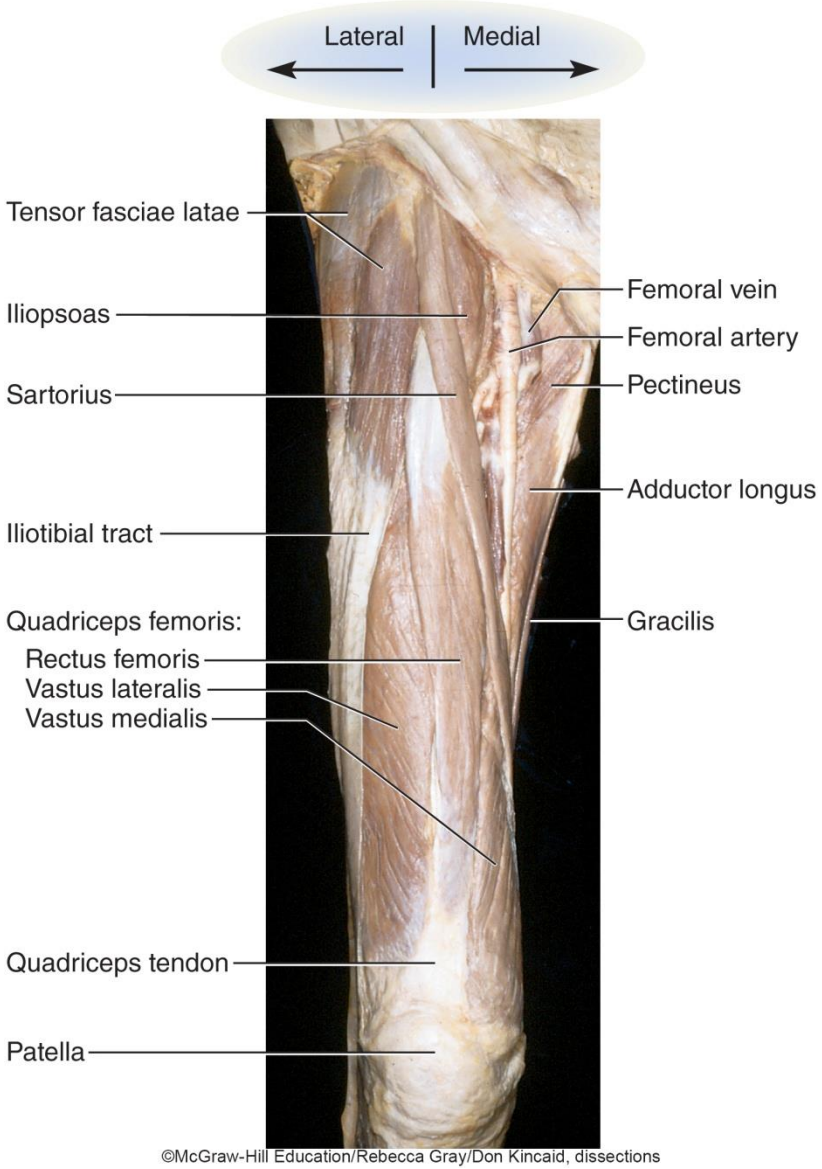

Figure 10.34

Muscles Acting on the Knee and Leg

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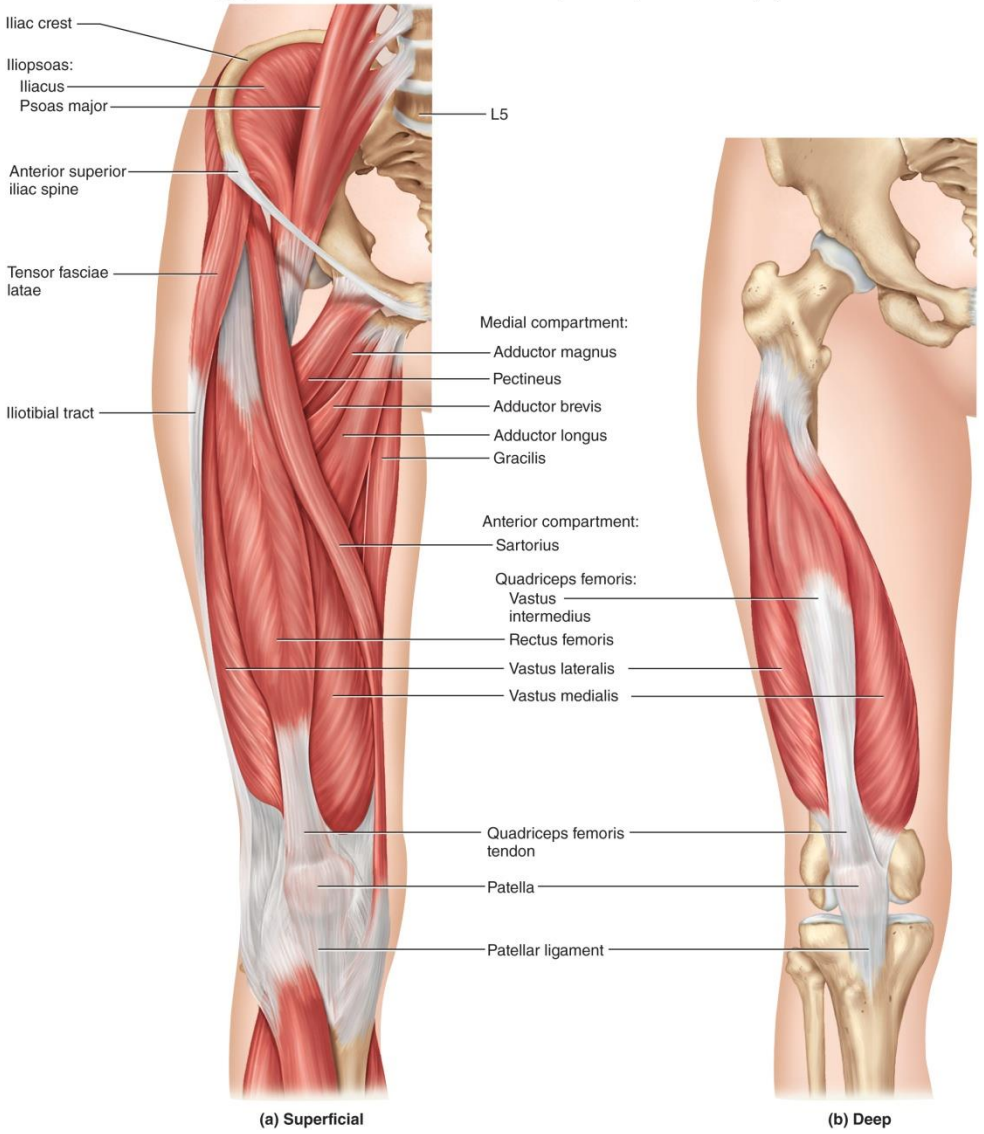

Figure 10.35a,b

Muscles Acting on the Knee and Leg

- **Posterior (flexor) compartment of the thigh**
  - Contains hamstring muscles
  - From lateral to medial:
    Biceps femoris
    Semitendinosus
    Semimembranosus

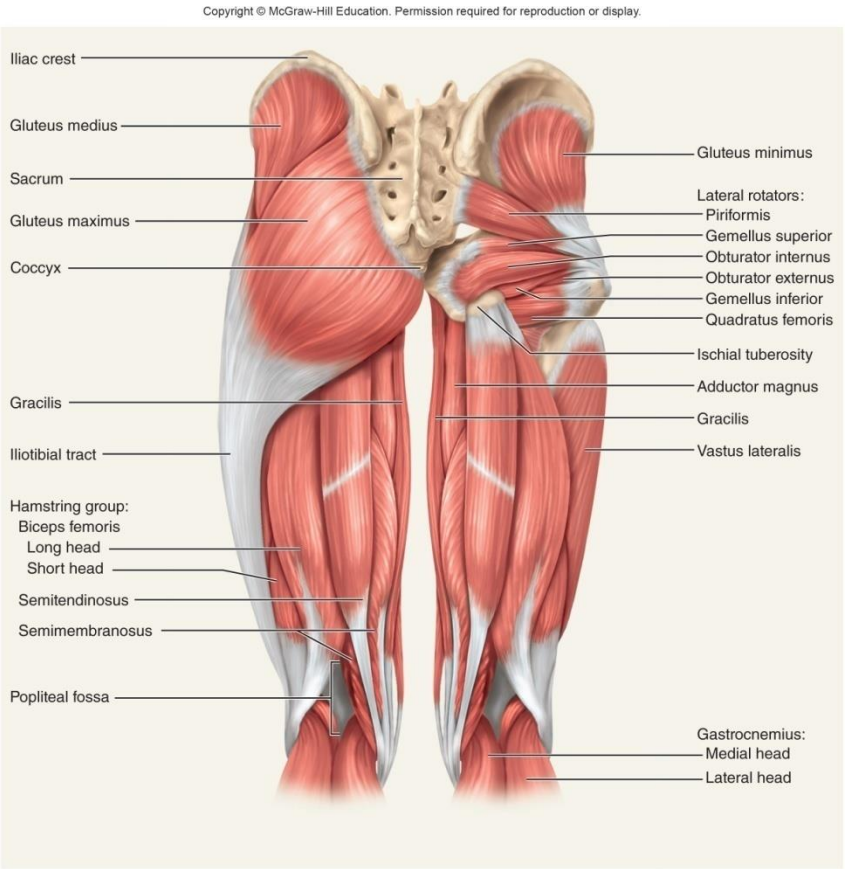

Figure 10.33

Muscles Acting on the Foot

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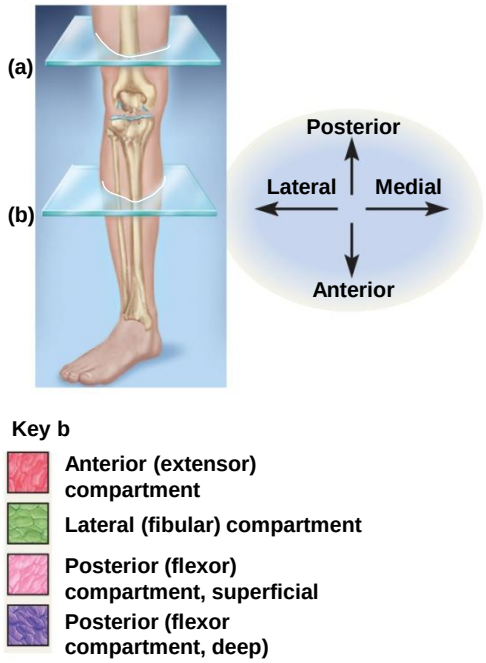
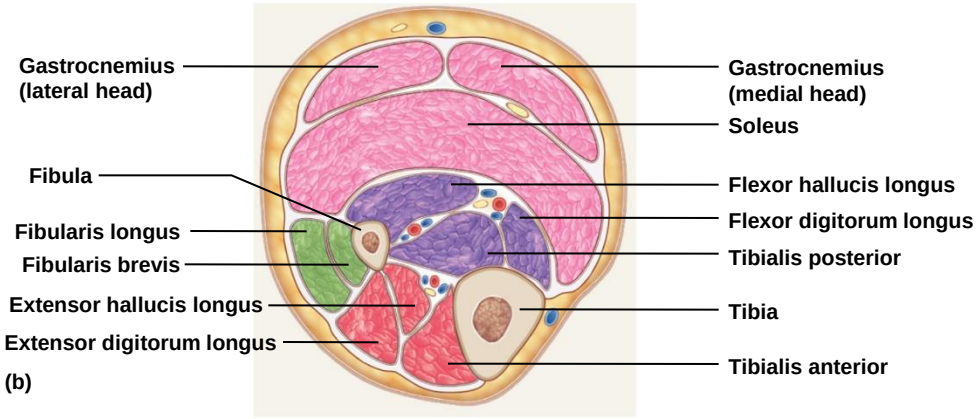


Figure 10.40b



- **Crural muscles, acting on the foot, are separated into three compartments**
  - Anterior compartment (red)
  - Fibular (lateral) compartment (green)
  - Posterior compartments (superficial = pink) (deep = purple)

Muscles Acting on the Foot

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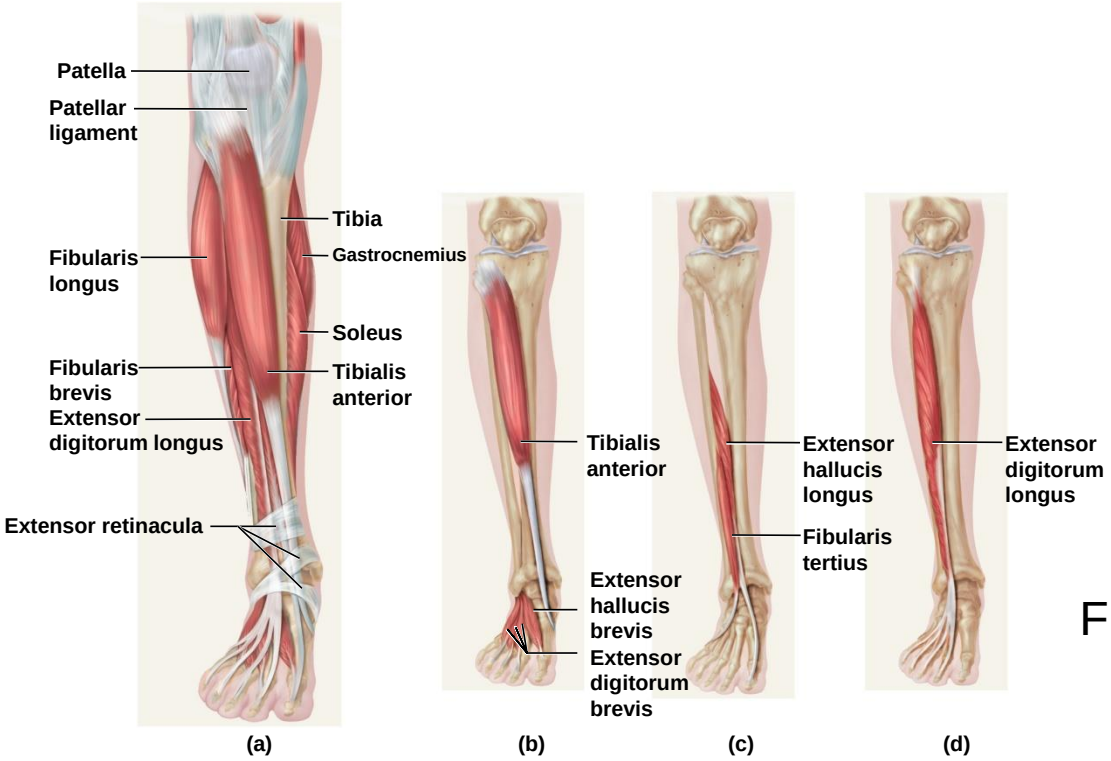

Figure 10.38a–d

- **Anterior (extensor) compartment of the leg**
  - Dorsiflex the ankle
  - Prevent toes from scuffing ground when walking
  - **Fibularis (peroneus) tertius**
  - **Extensor digitorum longus**
  - **Extensor hallucis longus**
  - **Tibialis anterior**

Muscles Acting on the Foot

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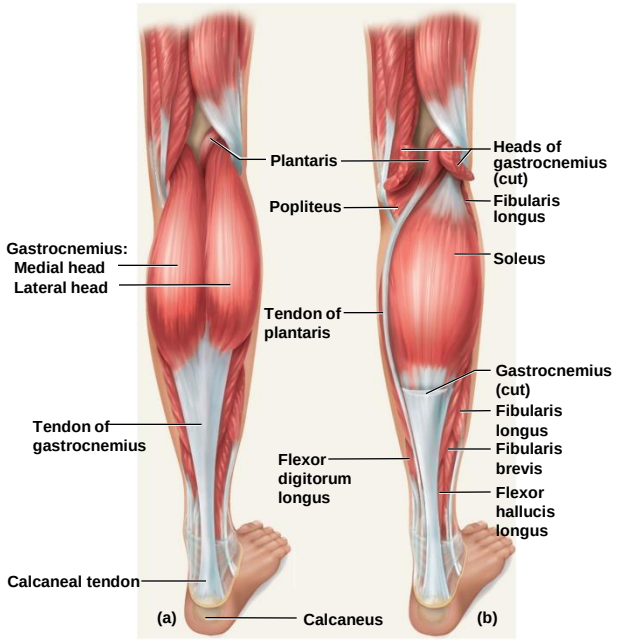

Figure 10.38a,b

- **Posterior compartment**—three muscles of the superficial group
  - **Gastrocnemius:** plantar flexes foot, flexes knee
  - **Soleus:** plantar flexes foot
  - **Plantaris:** weak synergist of triceps surae
- **Triceps surae**—collective name for *gastrocnemius* and *soleus*
  - Inserts on calcaneus by way of the calcaneal (Achilles) tendon
  - Strongest tendon in the body

Muscles Acting on the Foot

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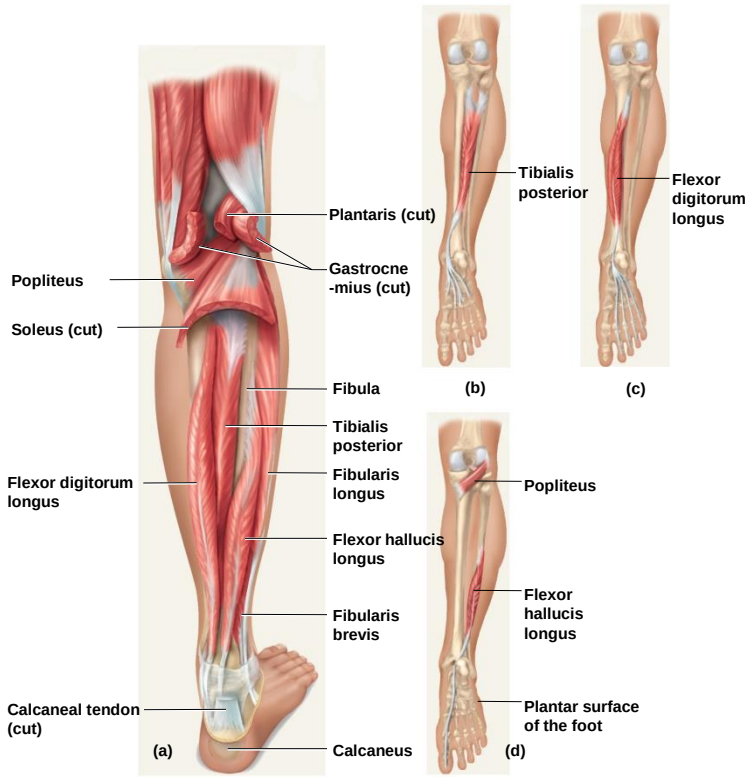

Figure 10.39

- **Posterior compartment—**four muscles in the deep group
  - **Flexor digitorum longus:** flexes phalanges
  - **Flexor hallucis longus:** flexes great toe
  - **Tibialis posterior:** inverts foot
  - **Popliteus:** acts on knee

Muscles Acting on the Foot

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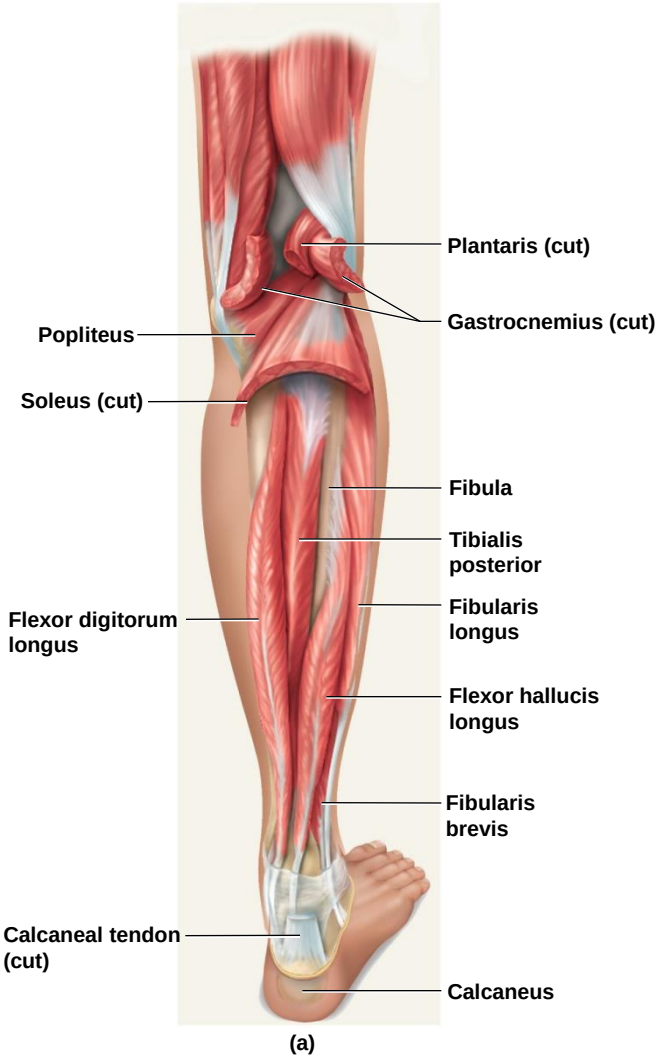

- **Lateral (fibular) compartment**—two muscles
  - **Fibularis longus**
  - **Fibularis brevis**
- **Both plantar flex and evert the foot**
- **Provide lift and forward thrust**

Figure 10.39a

Intrinsic Muscles of Foot

- **One dorsal muscle**
  - Extensor digitorum brevis extends toes
- **Four ventral muscle layers**
  - Support arches
  - Abduct and adduct the toes
  - Flex the toes

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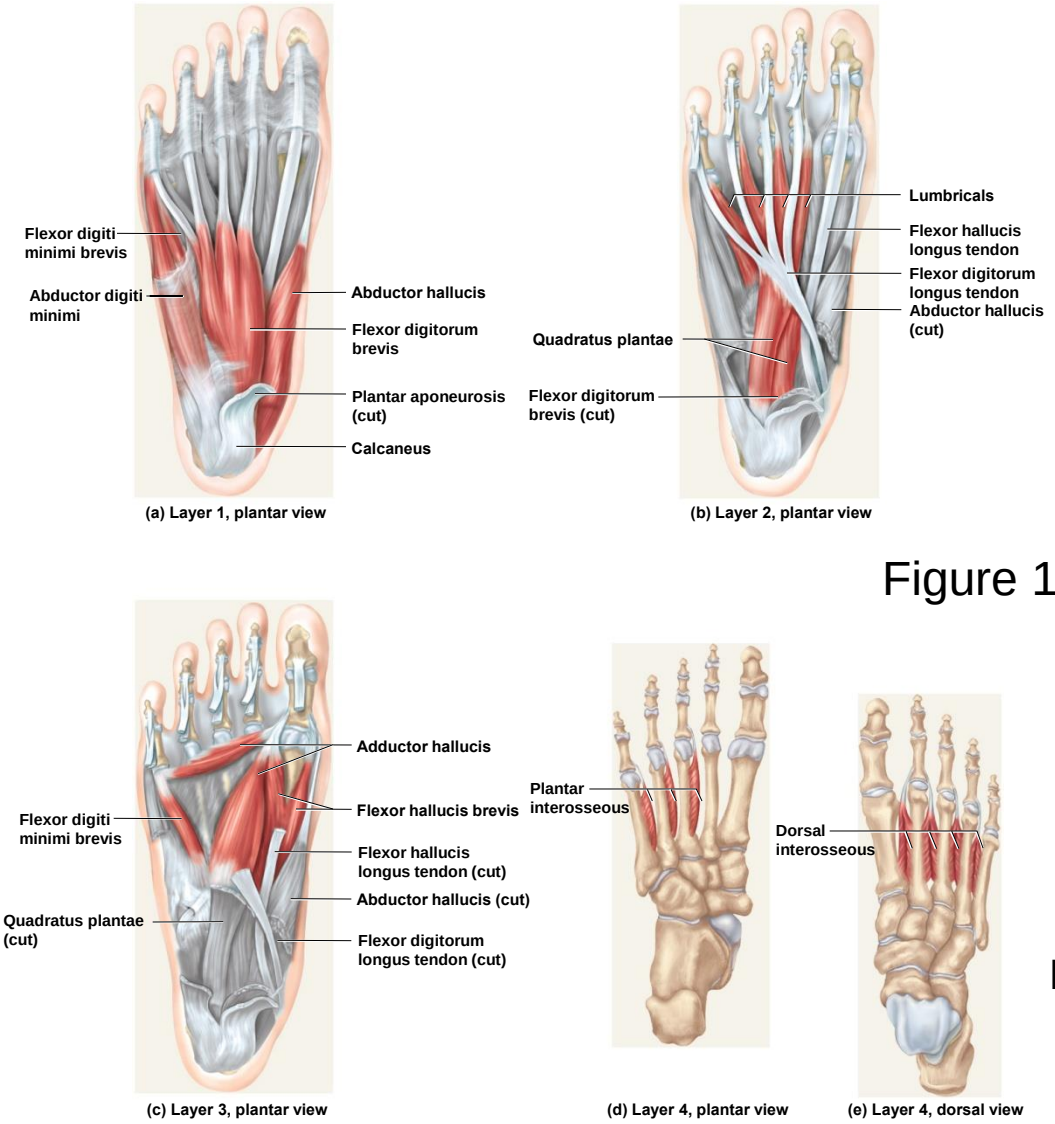

Figure 10.41a–e

Dorsal view

Common Athletic Injuries

- **Muscles and tendons are vulnerable to sudden and intense stress**
- **Proper conditioning and warm-up needed**
- **Common injuries include:**
  - Compartment syndrome
  - Shin splints
  - Pulled hamstrings
  - Tennis elbow
  - Pulled groin
  - Rotator cuff injury
- **Treat with rest, ice, compression, and elevation**
- **“No pain, no gain” is a dangerous misconception**