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TWELFTH GLOBAL EDITION

Elaine N. Marieb
Katja Hoehn

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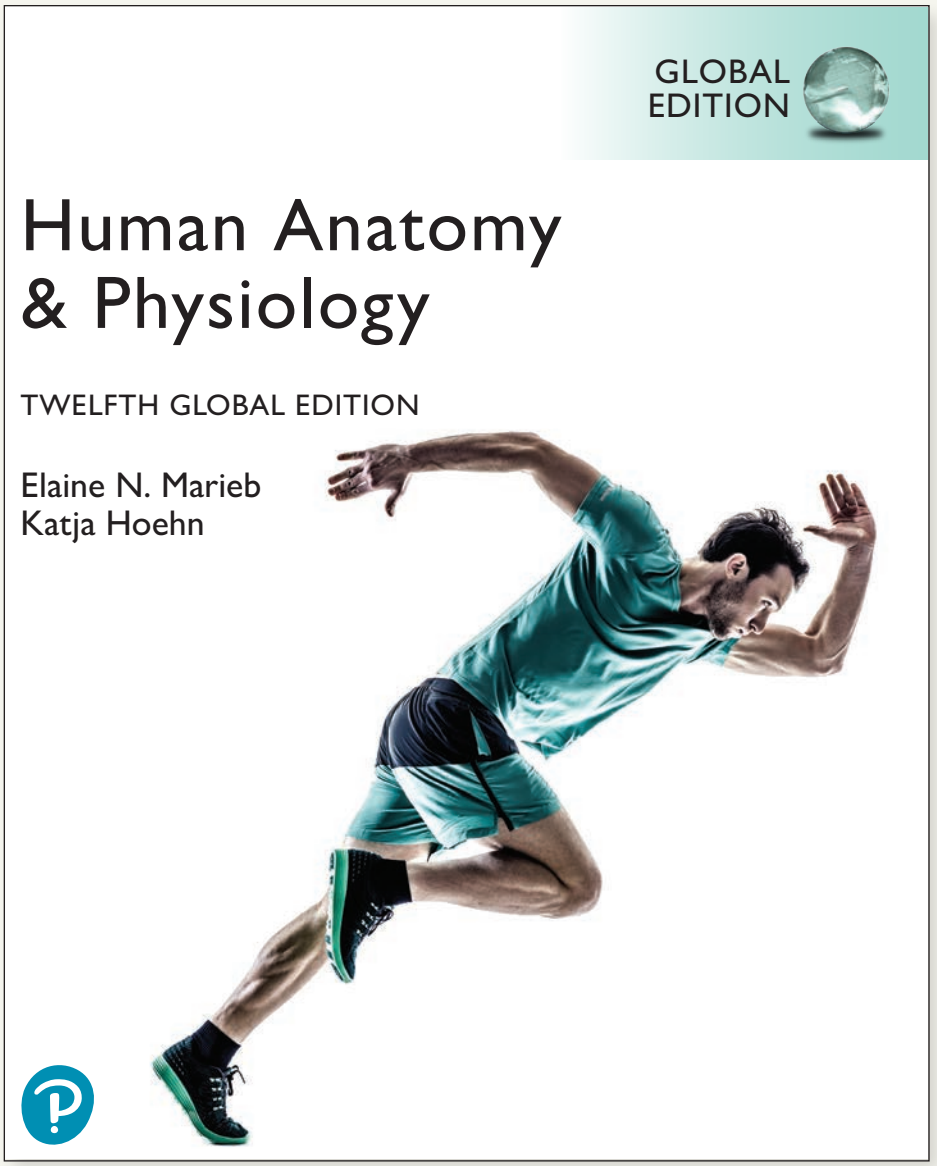


Pearson

MUSCLE GALLERY

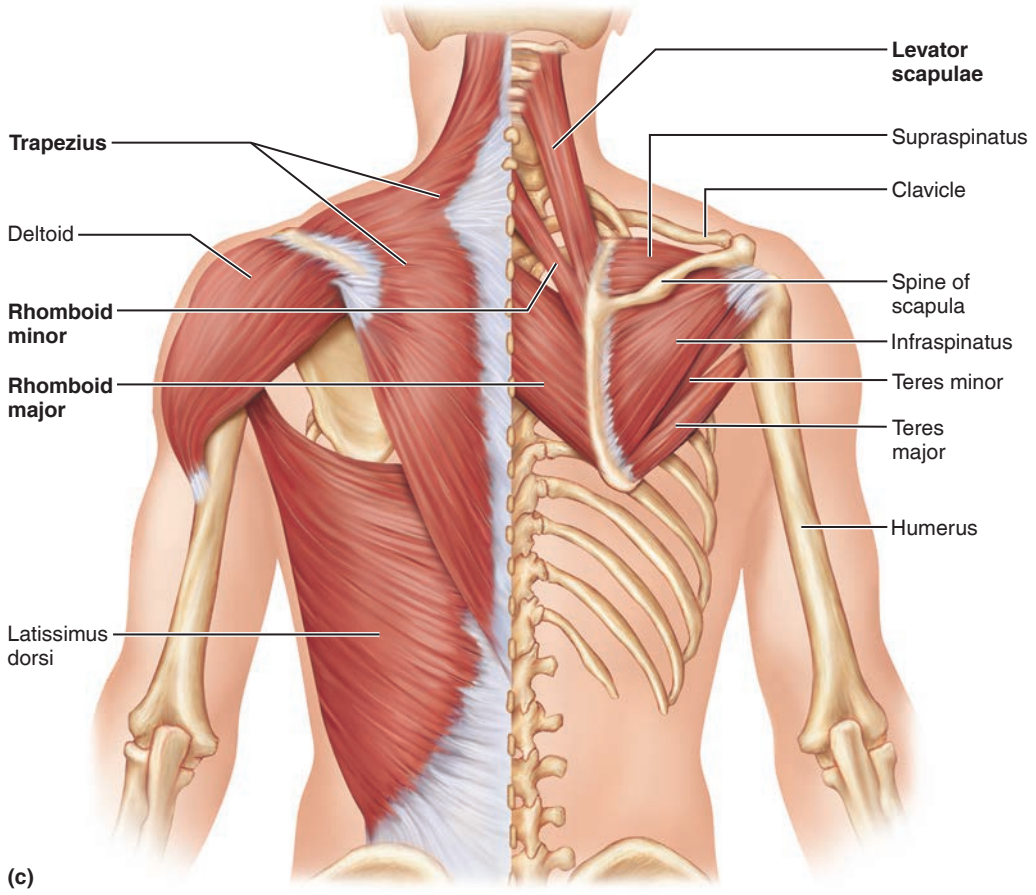
Table 10.8 Superficial Muscles of the Anterior and Posterior Thorax: Movements of the Scapula and Arm (Figure 10.14) *(continued)*

MUSCLE	DESCRIPTION	ORIGIN (O) AND INSERTION (I)	ACTION	NERVE SUPPLY
MUSCLES OF THE POSTERIOR THORAX (Figure 10.14c and d)				
Trapezius (trah-pe′ze-us) (*trapezion* = irregular four-sided figure)	Most superficial muscle of posterior thorax; flat and triangular; upper fibers run inferiorly to scapula; middle fibers run horizontally to scapula; lower fibers run superiorly to scapula	O—occipital bone, ligamentum nuchae, and spinous processes of C_7 and all thoracic vertebrae I—a continuous insertion along acromion and spine of scapula and lateral third of clavicle	Stabilizes, elevates, retracts, and rotates scapula; middle fibers retract (adduct) scapula; superior fibers elevate scapula (as in shrugging the shoulders) or help extend head with scapula fixed; inferior fibers depress scapula (and shoulder)	Accessory nerve (cranial nerve XI); C_3 and C_4
Levator scapulae (skap′u-le) (*levator* = raises)	Located at back and side of neck, deep to trapezius; thick straplike muscle	O—transverse processes of C_1–C_4 I—medial border of scapula, superior to spine	Elevates and adducts scapula in synergy with superior fibers of trapezius; tilts glenoid cavity downward when scapula is fixed, flexes neck to same side	Cervical spinal nerves and dorsal scapular nerve (C_3–C_5)
Rhomboids (rom′boidz)—major and minor (*rhomboid* = diamond shaped)	Two roughly diamond-shaped muscles lying deep to trapezius and inferior to levator scapulae; rhomboid minor is the more superior muscle	O—spinous processes of C_7 and T_1 (minor) and spinous processes of T_2–T_5 (major) I—medial border of scapula	Stabilize scapula; act together (and with middle trapezius fibers) to retract (adduct) scapula, thus "squaring shoulders"; rotate scapula so that glenoid cavity is downward (as when lowering arm against resistance; e.g., paddling a canoe)	Dorsal scapular nerve (C_4 and C_5)

Figure 10.14 *(continued)* **Superficial muscles of the thorax and shoulder acting on the scapula and arm. (c)** Posterior view. The superficial muscles are shown on the left side of the illustration. Superficial muscles are removed on the right side to reveal the deeper muscles acting on the scapula, and the rotator cuff muscles that help stabilize the shoulder joint. **(d)** Cadaver dissection showing view similar to (c).

MUSCLE GALLERY

Table 10.8 *(continued)*



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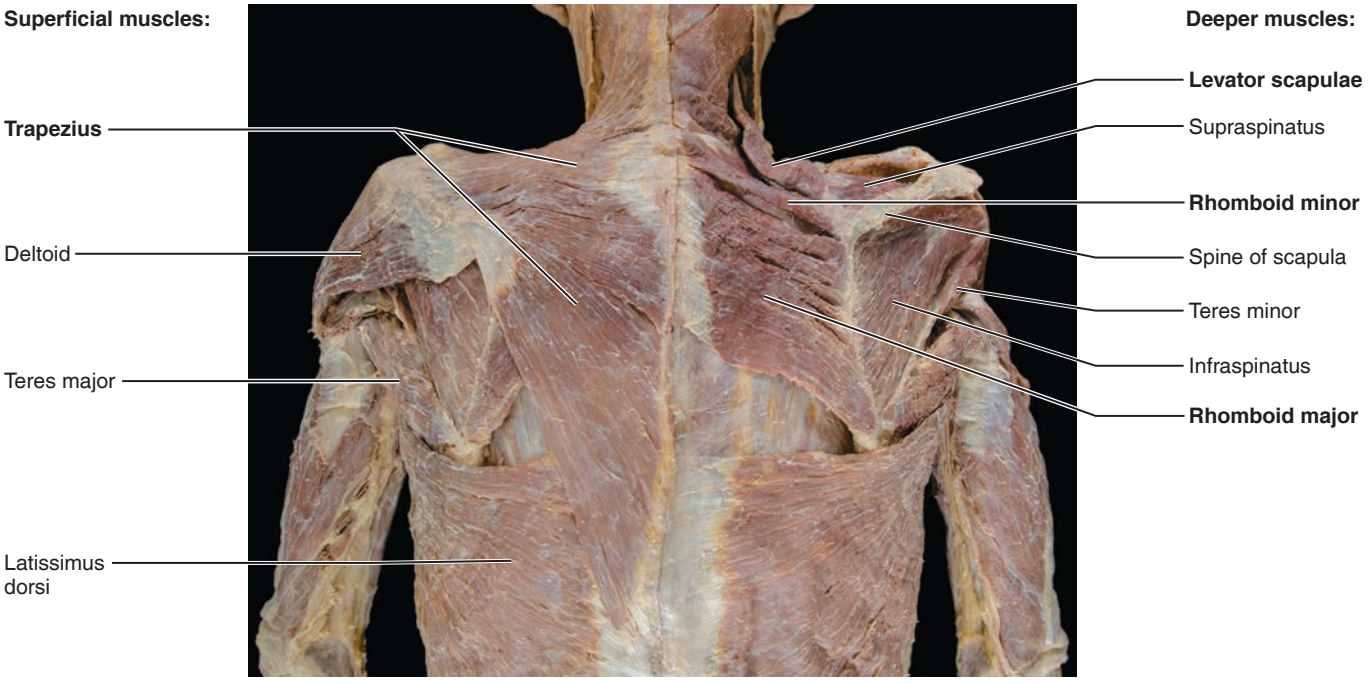

(d)

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MUSCLE GALLERY

Table 10.9 Muscles Crossing the Shoulder Joint: Movements of the Arm (Humerus) (Figure 10.15)

Recall that the ball-and-socket shoulder joint is the most flexible joint in the body, but pays the price of instability. Several muscles cross each shoulder joint to insert on the humerus. Most muscles acting on the humerus originate from the pectoral girdle. However, two of these—the latissimus dorsi and pectoralis major—primarily originate on the axial skeleton.

As you consider the arm movements, remember that the term *arm* refers to the region that contains the humerus. Of the nine muscles covered here, only the **pectoralis major**, **latissimus dorsi**, and **deltoid muscles** are prime movers of arm movements (Figure 10.15a, b). The remaining six are synergists and fixators.

There are four *rotator cuff* muscles: **supraspinatus**, **infraspinatus**, **teres minor**, and **subscapularis** (marked with an asterisk* in Figure 10.15b, d). They originate on the scapula, and their tendons blend with the fibrous capsule of the shoulder joint en route to the humerus. Although the rotator cuff muscles act as synergists in angular and rotational movements of the arm, their main function is to reinforce the capsule of the shoulder joint to prevent dislocation of the humerus.

Two small muscles, the **teres major** and **coracobrachialis**, cross the shoulder joint but do not reinforce it.

The interactions among the nine muscles that cross the shoulder joint are complex and each contributes to several movements. Table 10.12 (Part I) summarizes their action:

Flexion. Muscles that originate *anterior* to the shoulder joint *flex* the arm (lift it anteriorly). These flexors include the pectoralis major, the anterior fibers of the deltoid, and the coracobrachialis.

Extension. Muscles that originate *posterior* to the shoulder joint extend the arm. These include the latissimus dorsi and posterior fibers of the deltoid muscles (both prime movers of arm extension) and the teres major. (Note that the pectoralis and latissimus dorsi muscles are *antagonists* of one another in flexing and extending the arm.)

Abduction. The middle region of the fleshy deltoid muscle of the shoulder is the prime mover of arm *abduction*. It extends over the superior and lateral side of the humerus to pull it laterally.

Adduction. The main arm *adductors* are the pectoralis major anteriorly and latissimus dorsi posteriorly.

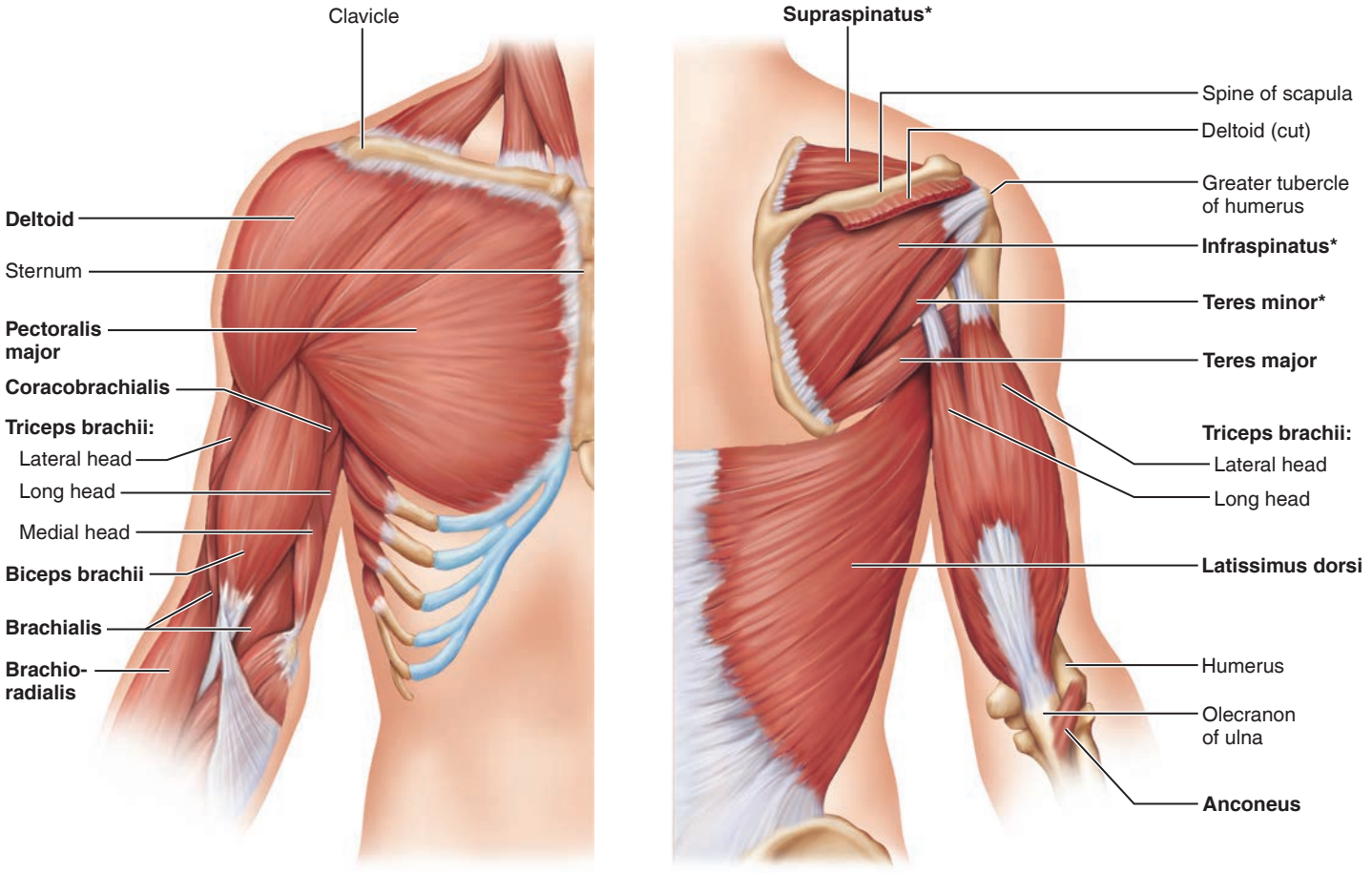
Rotation. Lateral and medial rotation of the arm are primarily brought about by the rotator cuff muscles.

MUSCLE	DESCRIPTION	ORIGIN (O) AND INSERTION (I)	ACTION	NERVE SUPPLY
Pectoralis major (pek″to-ra′lis ma′jer) (*pectus* = breast, chest; *major* = larger)	Large, fan-shaped muscle covering superior portion of chest; forms anterior axillary fold; divided into clavicular and sternal parts	O—sternal end of clavicle, sternum, cartilage of ribs 1–6 (or 7), and aponeurosis of external oblique muscle I—fibers converge to insert by a short tendon into intertubercular sulcus and greater tubercle of humerus	Adducts and medially rotates arm against resistance; clavicular part assists in flexion when arm is extended and sternal part assists in extension when the arm is flexed; with scapula (and arm) fixed, pulls rib cage upward, thus can help in climbing, throwing, pushing, and forced inspiration	Lateral and medial pectoral nerves (C_5–C_8 and T_1)
Deltoid (del′toid) (*delta* = triangular)	Thick, multipennate muscle forming rounded shoulder muscle mass; a common site for intramuscular injection, particularly in males, where it tends to be quite fleshy	O—lateral third of clavicle; acromion and spine of scapula (opposite insertion of the trapezius) I—deltoid tuberosity of humerus	Prime mover of arm abduction when all its fibers contract simultaneously; antagonist of pectoralis major and latissimus dorsi, which adduct the arm; if only anterior fibers are active, can act powerfully in flexing and rotating arm medially, therefore is a synergist of pectoralis major; if only posterior fibers are active, causes extension and lateral rotation of arm; active during rhythmic arm-swinging movements while walking	Axillary nerve (C_5 and C_6)

MUSCLE GALLERY

Table 10.9 *(continued)*

MUSCLE	DESCRIPTION	ORIGIN (O) AND INSERTION (I)	ACTION	NERVE SUPPLY
Latissimus dorsi (lah-tis′ĭ-mus dor′si) (*latissimus* = widest; *dorsi* = back)	Broad, flat, triangular muscle of lower back (lumbar region); extensive superficial origins; covered by trapezius superiorly; contributes to the posterior wall of axilla	O—indirect attachment via lumbodorsal fascia into spines of lower six thoracic vertebrae, lumbar vertebrae, lower 3 to 4 ribs, and iliac crest I—spirals around teres major to insert in floor of intertubercular sulcus of humerus	Prime mover of arm extension; powerful arm adductor; medially rotates arm; plays important role in lowering arm in a power stroke, as in striking a blow, hammering, swimming, and rowing; with arms fixed overhead, it pulls the rest of the body upward and forward, as in chin-ups	Thoracodorsal nerve (C_6–C_8)



(a) Anterior view (b) Posterior view

Figure 10.15 Muscles crossing the shoulder and elbow joints acting on the arm and forearm, respectively. Right side. **(a)** Superficial muscles of the anterior thorax, shoulder, and arm, anterior view. **(b)** Muscles of the posterior thorax and arm. The deltoid muscle of the shoulder and the trapezius muscle have been removed.

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*Rotator cuff muscles

MUSCLE GALLERY

Table 10.9 Muscles Crossing the Shoulder Joint: Movements of the Arm (Humerus) (Figure 10.15) *(continued)*

MUSCLE	DESCRIPTION	ORIGIN (O) AND INSERTION (I)	ACTION	NERVE SUPPLY
Subscapularis* (sub-scap″u-lar′is) (*sub* = under; *scapular* = scapula)	Forms part of posterior wall of axilla; tendon of insertion passes in front of shoulder joint; a rotator cuff muscle	O—subscapular fossa of scapula I—lesser tubercle of humerus	Rotates arm medially (prime mover), assisted by pectoralis major; helps hold head of humerus in glenoid cavity, stabilizing shoulder joint	Subscapular nerves (C_5–C_7)
Supraspinatus* (soo″prah-spi-nah′tus) (*supra* = above, over; *spin* = spine)	Named for its location on posterior aspect of scapula; deep to trapezius; a rotator cuff muscle	O—supraspinous fossa of scapula I—superior part of greater tubercle of humerus	Initiates abduction of arm, stabilizes shoulder joint; helps prevent downward dislocation of humerus, as when carrying a heavy suitcase	Suprascapular nerve
Infraspinatus* (in″frah-spi-nah′tus) (*infra* = below)	Partially covered by deltoid and trapezius; named for its scapular location; a rotator cuff muscle	O—infraspinous fossa of scapula I—greater tubercle of humerus posterior to insertion of supraspinatus	Rotates arm laterally; helps hold head of humerus in glenoid cavity, stabilizing the shoulder joint	Suprascapular nerve
Teres minor* (te′rēz) (*teres* = round; *minor* = lesser)	Small, elongated muscle; lies inferior to infraspinatus and may be inseparable from that muscle; a rotator cuff muscle	O—lateral border of dorsal scapular surface I—greater tubercle of humerus inferior to infraspinatus insertion	Same action(s) as infraspinatus muscle	Axillary nerve
Teres major	Thick, rounded muscle; located inferior to teres minor; helps form posterior wall of axilla (along with latissimus dorsi and subscapularis)	O—posterior surface of scapula at inferior angle I—crest of lesser tubercle on anterior humerus; insertion tendon fused with that of latissimus dorsi	Extends, medially rotates, and adducts arm; synergist of latissimus dorsi	Lower subscapular nerve (C_6 and C_7)
Coracobrachialis (kor″ah-ko-bra″ke-al′is) (*coraco* = coracoid; *brachi* = arm)	Small, cylindrical muscle	O—coracoid process of scapula I — medial surface of humerus shaft	Flexes and adducts arm; synergist of pectoralis major	Musculocutaneous nerve (C_5–C_7)

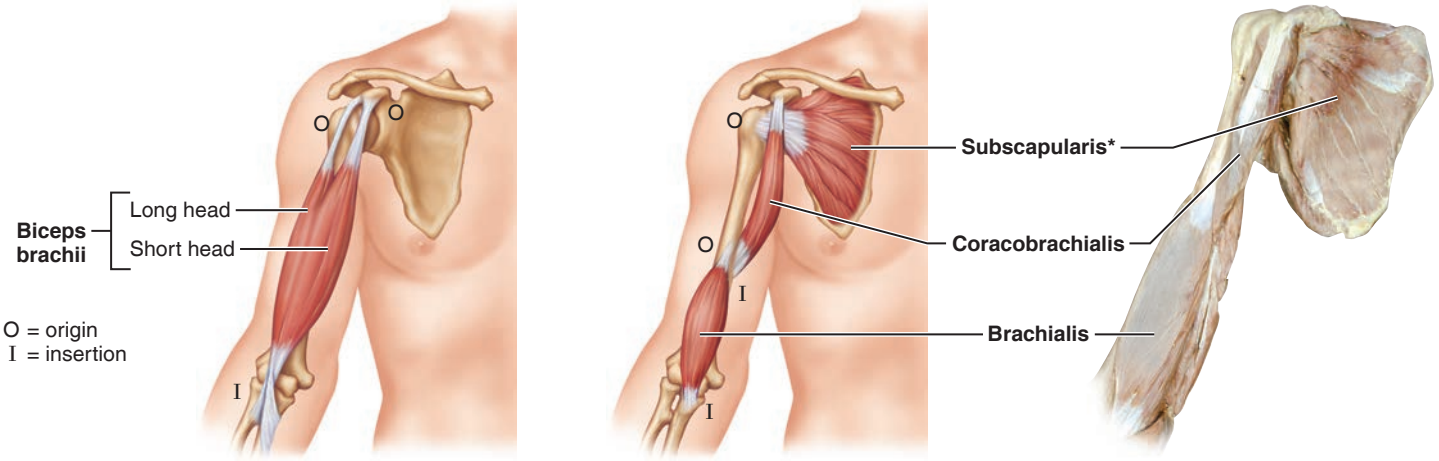

Figure 10.15 *(continued)* **Muscles crossing the shoulder and elbow joints acting on the arm and forearm, respectively. (c)** The isolated biceps brachii muscle of the anterior arm. **(d)** The brachialis muscle and the coracobrachialis and subscapularis muscles shown in isolation in the diagram on the left, and in a dissection on the right.

*Rotator cuff muscles

MUSCLE GALLERY

Table 10.10 Muscles Crossing the Elbow Joint: Flexion and Extension of the Forearm (Figure 10.15)

This table focuses on muscles that lie in the arm but move the forearm. These muscles cross the elbow joint to insert on the forearm bones, which they flex or extend. Walls of fascia divide the arm into two muscle compartments—the *posterior extensors* and *anterior flexors.*

Extension. The main forearm extensor is the bulky **triceps brachii** muscle, which forms nearly the entire musculature of the posterior compartment (Figure 10.15a, b).

Flexion. All anterior arm muscles flex the forearm (elbow). In order of decreasing strength, these are the **brachialis**, **biceps brachii**, and **brachioradialis** (Figure 10.15a, c, d). The brachialis and biceps insert (respectively) into the ulna and radius and contract simultaneously during flexion; they are the chief forearm flexors. The biceps brachii, a muscle that bulges when the forearm is flexed, is familiar to almost everyone. The brachialis, which lies deep to the biceps, is less known but is equally important in flexing the elbow. Because the brachioradialis arises from the distal humerus and inserts on the distal forearm, it resides mainly in the forearm. Its force is exerted far from the fulcrum (elbow), so the brachioradialis is a weak forearm flexor. The biceps muscle also supinates the forearm and is ineffective in flexing the elbow when the forearm *must* stay pronated. (This is why doing chin-ups with palms facing anteriorly is harder than with palms facing posteriorly.)

Table 10.12 (Part II) summarizes the actions of the muscles described here.

MUSCLE	DESCRIPTION	ORIGIN (O) AND INSERTION (I)	ACTION	NERVE SUPPLY
POSTERIOR MUSCLES				
Triceps brachii (tri′seps bra′ke-i) (*triceps* = three heads; *brachi* = arm)	Large fleshy muscle; the only muscle of posterior compartment of arm; three-headed origin; long and lateral heads lie superficial to medial head	O—long head: infraglenoid tubercle of scapula; lateral head: posterior shaft of humerus; medial head: posterior humeral shaft distal to radial groove I—by common tendon into olecranon of ulna	Powerful forearm extensor (prime mover, particularly medial head); antagonist of forearm flexors; long and lateral heads mainly active in extending the forearm against resistance; long head tendon may help stabilize shoulder joint and assist in arm adduction	Radial nerve (C_6–C_8)
Anconeus (an-ko′ne-us) (*ancon* = elbow) (see Figure 10.17)	Short triangular muscle; partially blended with distal end of triceps on posterior humerus	O—lateral epicondyle of humerus I—lateral aspect of olecranon of ulna	Synergist of triceps brachii in elbow extension; may control ulnar abduction during forearm pronation	Radial nerve
ANTERIOR MUSCLES				
Biceps brachii (bi′seps) (*biceps* = two heads)	Two-headed fusiform muscle; bellies unite as insertion point is approached; tendon of long head helps stabilize shoulder joint	O—short head: coracoid process; long head: supraglenoid tubercle and lip of glenoid cavity; tendon of long head runs within shoulder joint capsule and into intertubercular sulcus of humerus I—by common tendon into radial tuberosity	Flexes and supinates forearm; these actions usually occur at same time (e.g., when you open a bottle of wine, it turns the corkscrew and pulls the cork); weak flexor of arm at shoulder	Musculocutaneous nerve (C_5 and C_6)
Brachialis (bra′ke-al-is)	Strong muscle that is immediately deep to biceps brachii on distal humerus	O—anterior surface of distal humerus; embraces insertion of deltoid muscle I—coronoid process of ulna and capsule of elbow joint	A major forearm flexor (lifts ulna as biceps lifts the radius)	Musculocutaneous nerve
Brachioradialis (bra″ke-o-ra″de-al′is) (*radi* = radius, ray) (also see Figure 10.16)	Superficial muscle of lateral forearm; forms lateral boundary of cubital fossa; extends from distal humerus to distal forearm	O—lateral supracondylar ridge at distal end of humerus I—base of radial styloid process	Synergist in flexing forearm; acts to best advantage when forearm is partially flexed and semipronated; stabilizes elbow during rapid flexion *and* extension	Radial nerve (an important exception: the radial nerve typically serves extensor muscles)