

Department of Human Anatomy

MUCOM 2019

Head and Neck Anatomy

Lecture Nineteen

Back Muscles & Suboccipital Triangle

8-12-2019

BACK MUSCULATURE

Muscles of the back are organized into superficial, intermediate, and deep groups.

Muscles in the superficial and intermediate groups are extrinsic muscles because they originate embryologically from locations other than the back. They are innervated by anterior rami of spinal nerves:

- The superficial group consists of muscles related to and involved in movements of the upper limb.
- The intermediate group consists of muscles attached to the ribs and may serve a respiratory function.

Muscles of the deep group are intrinsic muscles because they develop in the back. They are innervated by posterior rami of spinal nerves and are directly related to movements of the vertebral column and head.

Superficial group of back muscles

The muscles in the superficial group are immediately deep to the skin and superficial fascia (Figs. 2.42 to 2.45). They attach the superior part of the appendicular skeleton (clavicle, scapula, and humerus) to the axial skeleton (skull, ribs, and vertebral column). Because these muscles are primarily involved with movements of this part of the appendicular skeleton, they are sometimes referred to as the **appendicular group**.

Muscles in the superficial group include the trapezius, latissimus dorsi, rhomboid major, rhomboid minor, and levator scapulae. The rhomboid major, rhomboid minor, and levator scapulae muscles are located deep to the trapezius muscle in the superior part of the back.

Table 2.1 Superficial (appendicular) group of back muscles

Muscle	Origin	Insertion	Innervation	Function
Trapezius	Superior nuchal line, external occipital protuberance, ligamentum nuchae, spinous processes of CVII to TXII	Lateral one third of clavicle, acromion, spine of scapula	Motor—accessory nerve [XI]; proprioception—C3 and C4	Assists in rotating the scapula during abduction of humerus above horizontal; upper fibers elevate, middle fibers adduct, and lower fibers depress scapula
Latissimus dorsi	Spinous processes of TVII to LV and sacrum, iliac crest, ribs X to XII	Floor of intertubercular sulcus of humerus	Thoracodorsal nerve (C6 to C8)	Extends, adducts, and medially rotates humerus
Levator scapulae	Transverse processes of C1 to C4	Upper portion medial border of scapula	C3 to C4 and dorsal scapular nerve (C4, C5)	Elevates scapula
Rhomboid major	Spinous processes of TII to TV	Medial border of scapula between spine and inferior angle	Dorsal scapular nerve (C4, C5)	Retracts (adducts) and elevates scapula
Rhomboid minor	Lower portion of ligamentum nuchae, spinous processes of CVII and TI	Medial border of scapula at spine of scapula	Dorsal scapular nerve (C4, C5)	Retracts (adducts) and elevates scapula

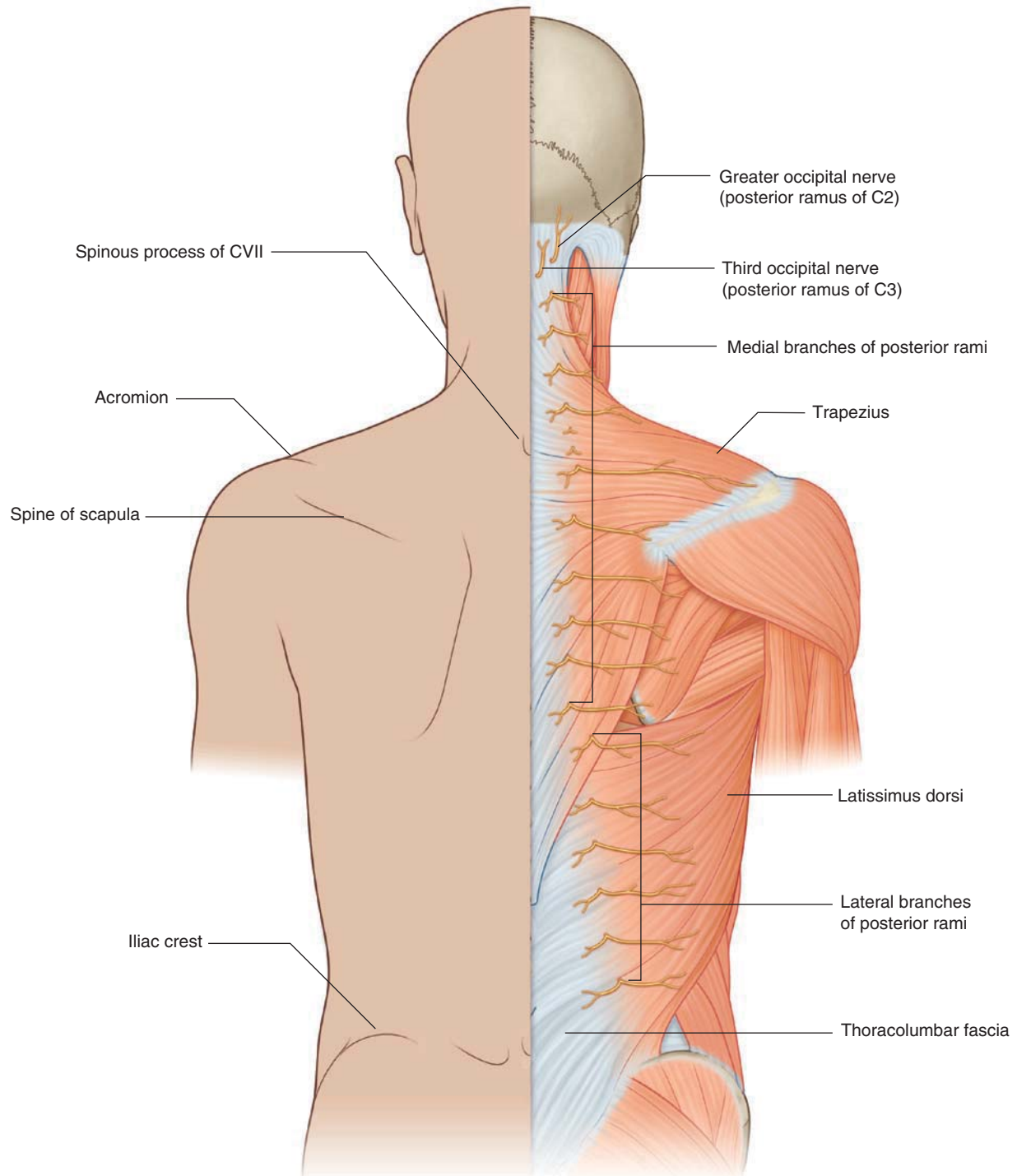


Fig. 2.42 Superficial group of back muscles—trapezius and latissimus dorsi.

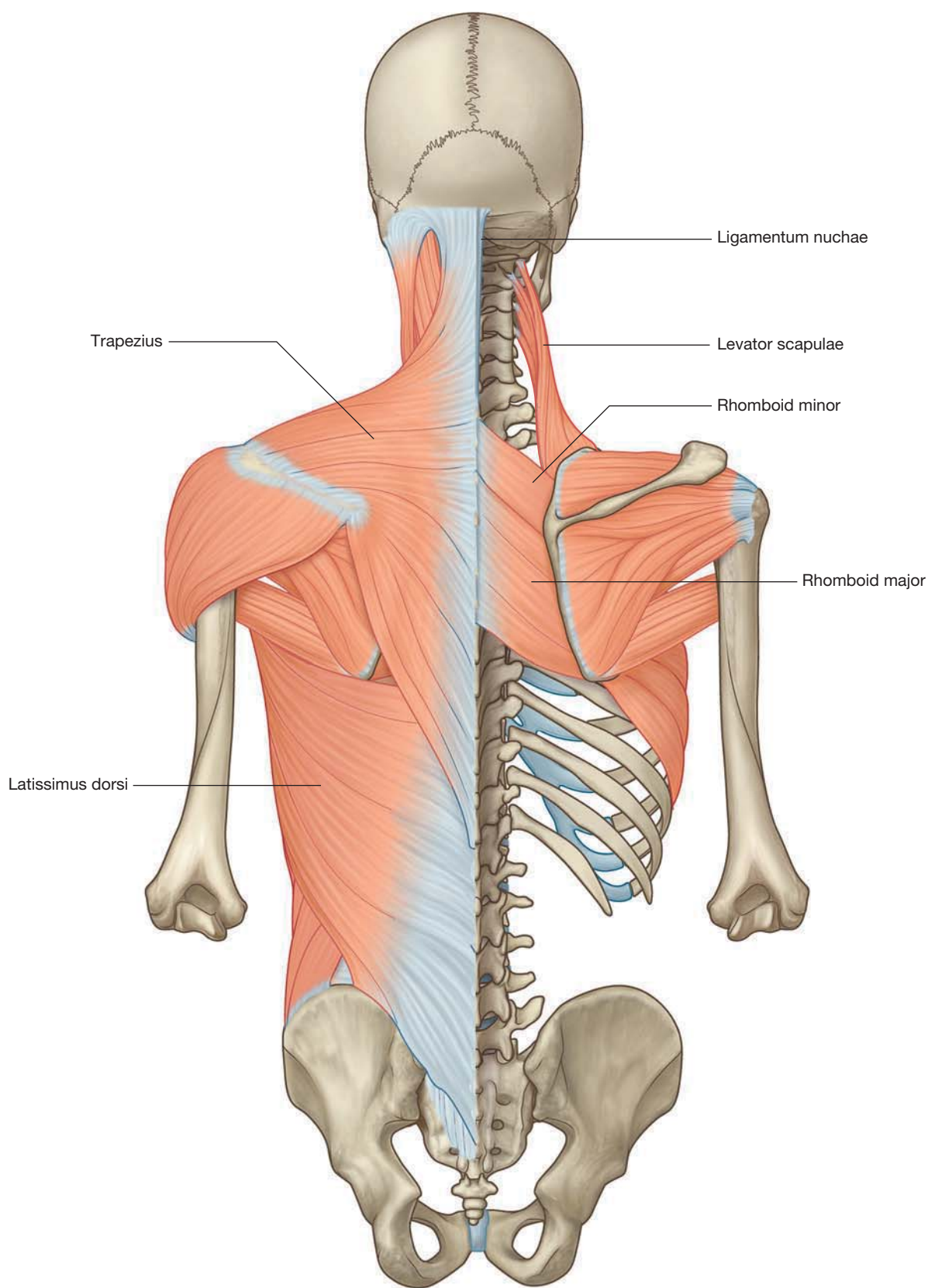
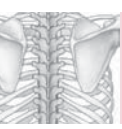


Fig. 2.43 Superficial group of back muscles—trapezius and latissimus dorsi, with rhomboid major, rhomboid minor, and levator scapulae located deep to trapezius in the superior part of the back.



Intermediate group of back muscles

The muscles in the intermediate group of back muscles consist of two thin muscular sheets in the superior and inferior regions of the back, immediately deep to the muscles in the superficial group (Fig. 2.47 and Table 2.2). Fibers from these two serratus posterior muscles (**serratus posterior superior** and **serratus posterior inferior**) pass obliquely outward from the vertebral column to attach to the ribs. This positioning suggests a respiratory function,

and at times, these muscles have been referred to as the respiratory group.

Serratus posterior superior is deep to the rhomboid muscles, whereas serratus posterior inferior is deep to the latissimus dorsi. Both serratus posterior muscles are attached to the vertebral column and associated structures medially, and either descend (the fibers of the serratus posterior superior) or ascend (the fibers of the serratus posterior inferior) to attach to the ribs. These two muscles therefore elevate and depress the ribs.

The serratus posterior muscles are innervated by segmental branches of anterior rami of intercostal nerves. Their vascular supply is provided by a similar segmental pattern through the intercostal arteries.

Table 2.2 Intermediate (respiratory) group of back muscles

Muscle	Origin	Insertion	Innervation	Function
Serratus posterior superior	Lower portion of ligamentum nuchae, spinous processes of CVII to TIII, and supraspinous ligaments	Upper border of ribs II to V just lateral to their angles	Anterior rami of upper thoracic nerves (T2 to T5)	Elevates ribs II to V
Serratus posterior inferior	Spinous processes of TXI to LIII and supraspinous ligaments	Lower border of ribs IX to XII just lateral to their angles	Anterior rami of lower thoracic nerves (T9 to T12)	Depresses ribs IX to XII and may prevent lower ribs from being elevated when the diaphragm contracts

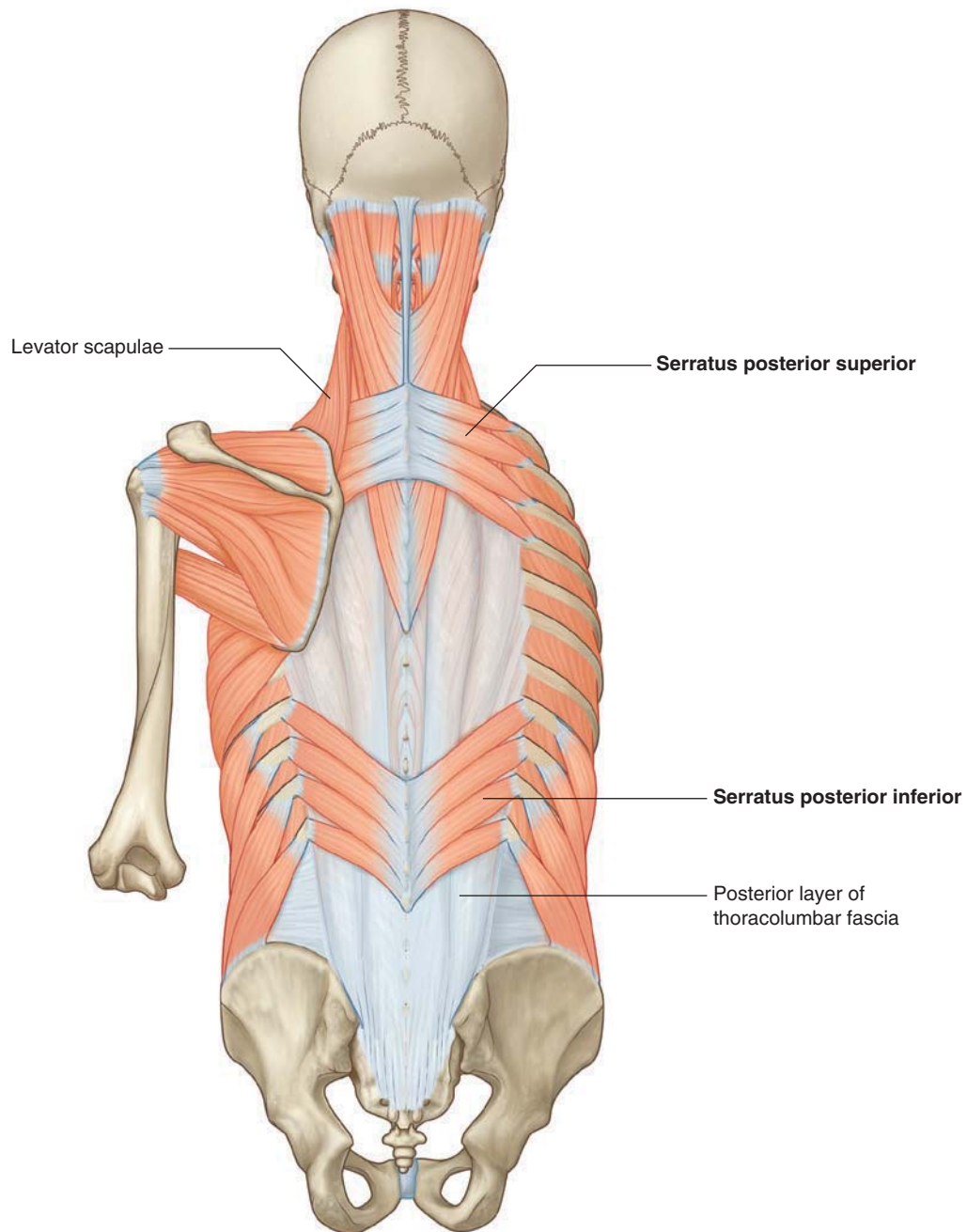


Fig. 2.47 Intermediate group of back muscles—serratus posterior muscles.

Deep group of back muscles

The deep or intrinsic muscles of the back extend from the pelvis to the skull and are innervated by segmental branches of the posterior rami of spinal nerves. They include:

- the extensors and rotators of the head and neck—the splenius capitis and cervicis (spinotransversales muscles),
- the extensors and rotators of the vertebral column—the erector spinae and transversospinales, and
- the short segmental muscles—the interspinales and intertransversarii.

The vascular supply to this deep group of muscles is through branches of the vertebral, deep cervical, occipital, transverse cervical, posterior intercostal, subcostal, lumbar, and lateral sacral arteries.

Thoracolumbar fascia

The **thoracolumbar fascia** covers the deep muscles of the back and trunk (Fig. 2.48). This fascial layer is critical to the overall organization and integrity of the region:

- Superiorly, it passes anteriorly to the serratus posterior muscle and is continuous with deep fascia in the neck.
- In the thoracic region, it covers the deep muscles and separates them from the muscles in the superficial and intermediate groups.
- Medially, it attaches to the spinous processes of the thoracic vertebrae and, laterally, to the angles of the ribs.

The medial attachments of the latissimus dorsi and serratus posterior inferior muscles blend into the thoracolumbar fascia. In the lumbar region, the thoracolumbar fascia consists of three layers:

- The posterior layer is thick and is attached to the spinous processes of the lumbar vertebrae and sacral vertebrae and to the supraspinous ligament—from these attachments, it extends laterally to cover the erector spinae.
- The middle layer is attached medially to the tips of the transverse processes of the lumbar vertebrae and intertransverse ligaments—inferiorly, it is attached to the iliac crest and, superiorly, to the lower border of rib XII.
- The anterior layer covers the anterior surface of the quadratus lumborum muscle (a muscle of the posterior

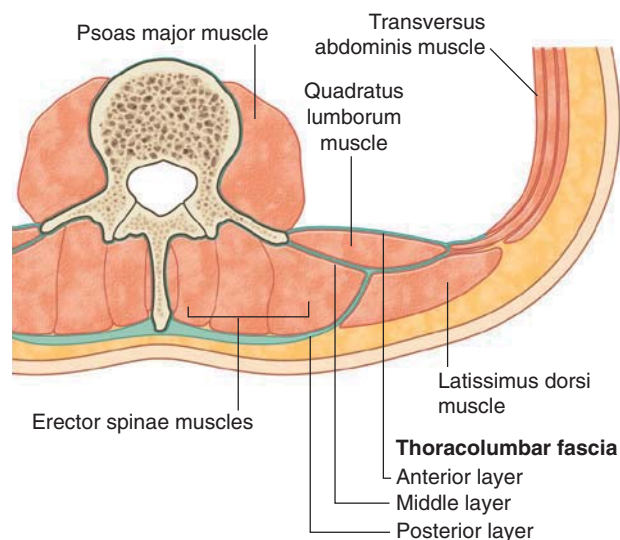


Fig. 2.48 Thoracolumbar fascia and the deep back muscles (transverse section).

abdominal wall) and is attached medially to the transverse processes of the lumbar vertebrae—inferiorly, it is attached to the iliac crest and, superiorly, it forms the lateral arcuate ligament for attachment of the diaphragm.

The posterior and middle layers of the thoracolumbar fascia come together at the lateral margin of the erector spinae (Fig. 2.48). At the lateral border of the quadratus lumborum, the anterior layer joins them and forms the aponeurotic origin for the transversus abdominis muscle of the abdominal wall.

Spinotransversales muscles

The two spinotransversales muscles run from the spinous processes and ligamentum nuchae upward and laterally (Fig. 2.49 and Table 2.3):

- The splenius capitis is a broad muscle attached to the occipital bone and mastoid process of the temporal bone.
- The splenius cervicis is a narrow muscle attached to the transverse processes of the upper cervical vertebrae.

Together the spinotransversales muscles draw the head backward, extending the neck. Individually, each muscle rotates the head to one side—the same side as the contracting muscle.

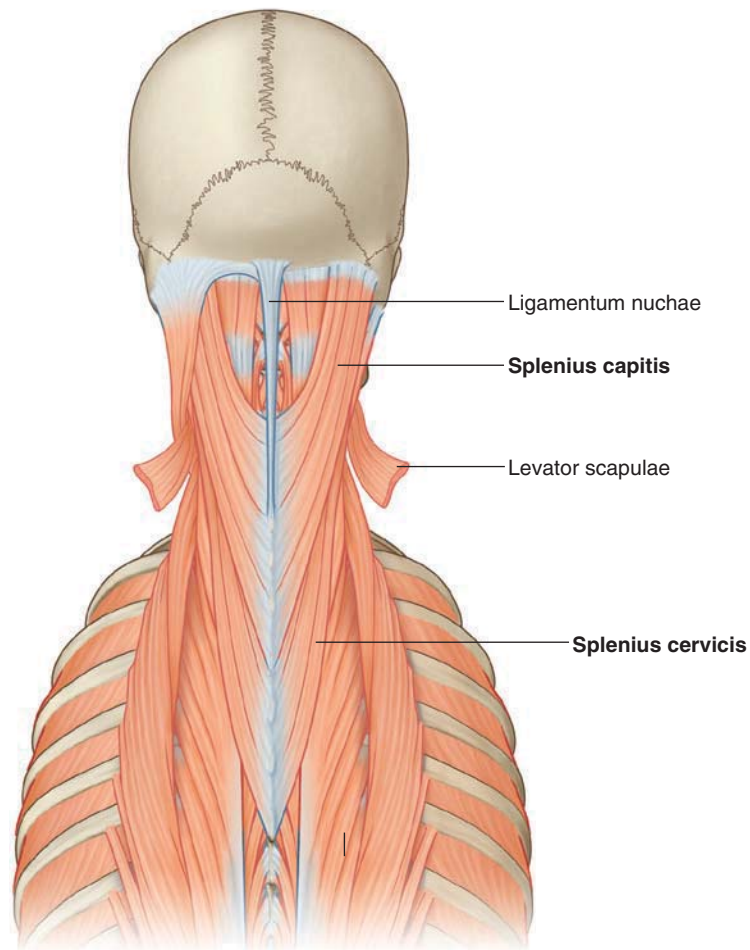


Fig. 2.49 Deep group of back muscles—spinotransversales muscles (splenius capitis and splenius cervicis).

Table 2.3 Spinotransversales muscles

Muscle	Origin	Insertion	Innervation	Function
Splenius capitis	Lower half of ligamentum nuchae, spinous processes of CVII to TIV	Mastoid process, skull below lateral one third of superior nuchal line	Posterior rami of middle cervical nerves	Together—draw head backward, extending neck; individually—draw and rotate head to one side (turn face to same side)
Splenius cervicis	Spinous processes of TIII to TVI	Transverse processes of C1 to CIII	Posterior rami of lower cervical nerves	Together—extend neck; individually—draw and rotate head to one side (turn face to same side)

Erector spinae muscles

The erector spinae is the largest group of intrinsic back muscles. The muscles lie posterolaterally to the vertebral column between the spinous processes medially and the angles of the ribs laterally. They are covered in the thoracic and lumbar regions by thoracolumbar fascia and the serratus posterior inferior, rhomboid, and splenius muscles. The mass arises from a broad, thick tendon

attached to the sacrum, the spinous processes of the lumbar and lower thoracic vertebrae, and the iliac crest (Fig. 2.50 and Table 2.4). It divides in the upper lumbar region into three vertical columns of muscle, each of which is further subdivided regionally (lumborum, thoracis, cervicis, and capitis), depending on where the muscles attach superiorly.

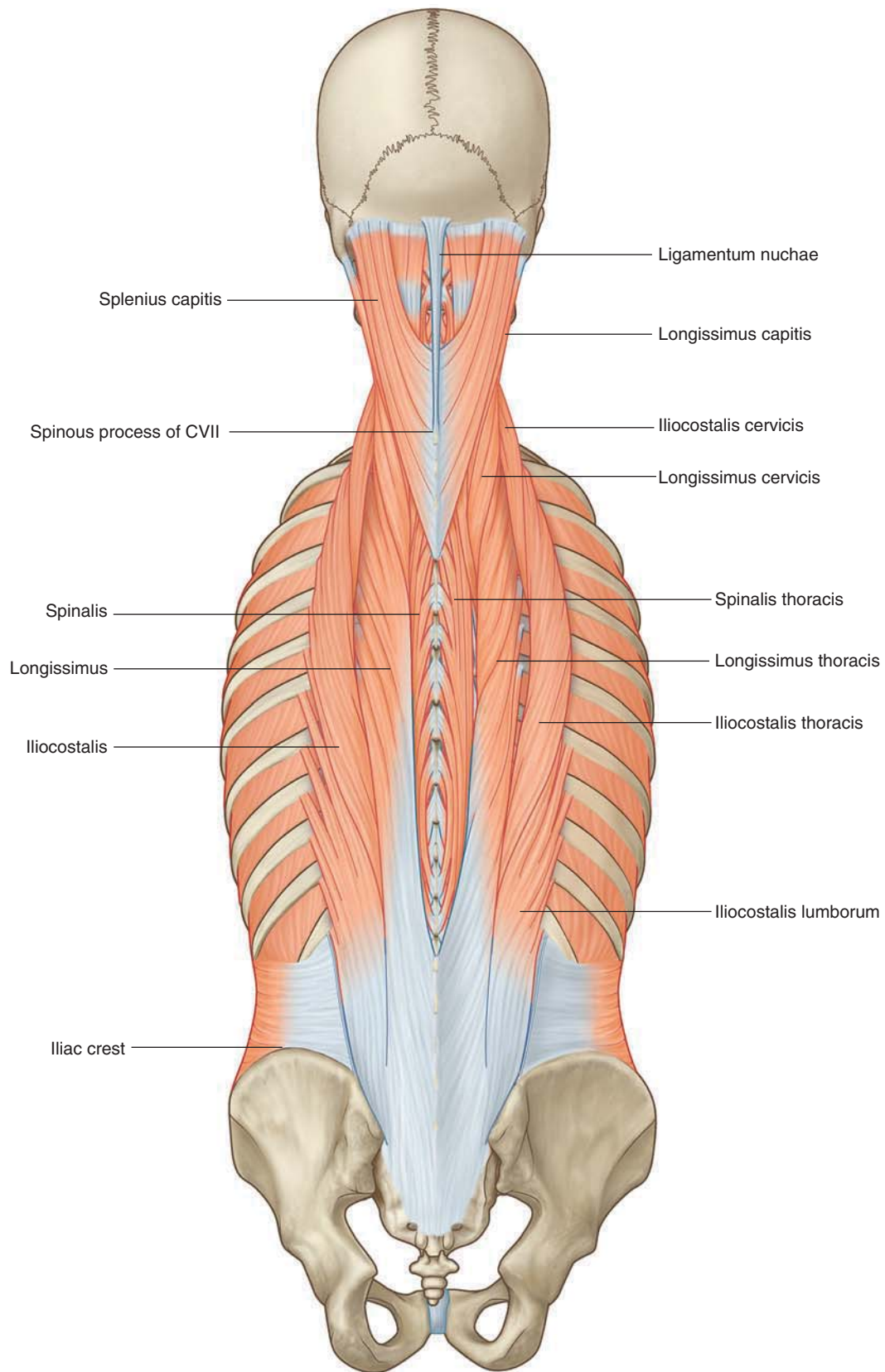


Fig. 2.50 Deep group of back muscles—erector spinae muscles.

- The outer or most laterally placed column of the erector spinae muscles is the **iliocostalis**.
- The middle or intermediate column is the **longissimus**, which is the largest of the erector spinae subdivision extending from the common tendon of origin to the base of the skull.
- The most medial muscle column is the **spinalis**, which is the smallest of the subdivisions and interconnects the spinous processes of adjacent vertebrae.

The muscles in the erector spinae group are the primary extensors of the vertebral column and head. Acting bilaterally, they straighten the back, returning it to the upright position from a flexed position, and pull the head posteriorly. They also participate in controlling vertebral column flexion by contracting and relaxing in a coordinated fashion. Acting unilaterally, they bend the vertebral column laterally. In addition, unilateral contractions of muscles attached to the head turn the head to the actively contracting side.

Transversospinales muscles

The transversospinales muscles run obliquely upward and medially from transverse processes to spinous processes, filling the groove between these two vertebral projections (Fig. 2.51 and Table 2.5). They are deep to the erector spinae and consist of three major subgroups—the semispinalis, multifidus, and rotatores muscles.

When muscles in the transversospinales group contract bilaterally, they extend the vertebral column, an action similar to that of the erector spinae group. However, when muscles on only one side contract, they pull the spinous processes toward the transverse processes on that side, causing the trunk to turn or rotate in the opposite direction.

One muscle in the transversospinales group, the **semi-spinalis capitis**, has a unique action because it attaches to the skull. Contracting bilaterally, this muscle pulls the head posteriorly, whereas unilateral contraction pulls the head posteriorly and turns it, causing the chin to move superiorly and turn toward the side of the contracting muscle. These actions are similar to those of the upper erector spinae.

Segmental muscles

The two groups of segmental muscles (Fig. 2.51 and Table 2.6) are deeply placed in the back and innervated by posterior rami of spinal nerves.

- The first group of segmental muscles are the **levatorum costarum** muscles. Contraction elevates the ribs.

- The second group of segmental muscles are the true segmental muscles of the back—the **interspinales**, which pass between adjacent spinous processes, and the **intertransversarii**, which pass between adjacent transverse processes. These postural muscles stabilize adjoining vertebrae during movements of the vertebral column to allow more effective action of the large muscle groups.

Suboccipital muscles

A small group of deep muscles in the upper cervical region at the base of the occipital bone move the head. They connect vertebra CI (the atlas) to vertebra CII (the axis) and connect both vertebrae to the base of the skull. Because of their location they are sometimes referred to as suboccipital muscles (Figs. 2.51 and 2.52 and Table 2.7). They include, on each side:

- **rectus capitis posterior major**,
- **rectus capitis posterior minor**,
- **obliquus capitis inferior**, and
- **obliquus capitis superior**.

Contraction of the suboccipital muscles extends and rotates the head at the atlanto-occipital and atlanto-axial joints, respectively.

The suboccipital muscles are innervated by the posterior ramus of the first cervical nerve, which enters the area between the vertebral artery and the posterior arch of the atlas (Fig. 2.52). The vascular supply to the muscles in

this area is from branches of the vertebral and occipital arteries.

The suboccipital muscles form the boundaries of the **suboccipital triangle**, an area that contains several important structures (Fig. 2.52):

- The rectus capitis posterior major muscle forms the medial border of the triangle.
- The obliquus capitis superior muscle forms the lateral border.
- The obliquus capitis inferior muscle forms the inferior border.

The contents of the suboccipital triangle include:

- posterior ramus of CI,
- vertebral artery, and
- veins

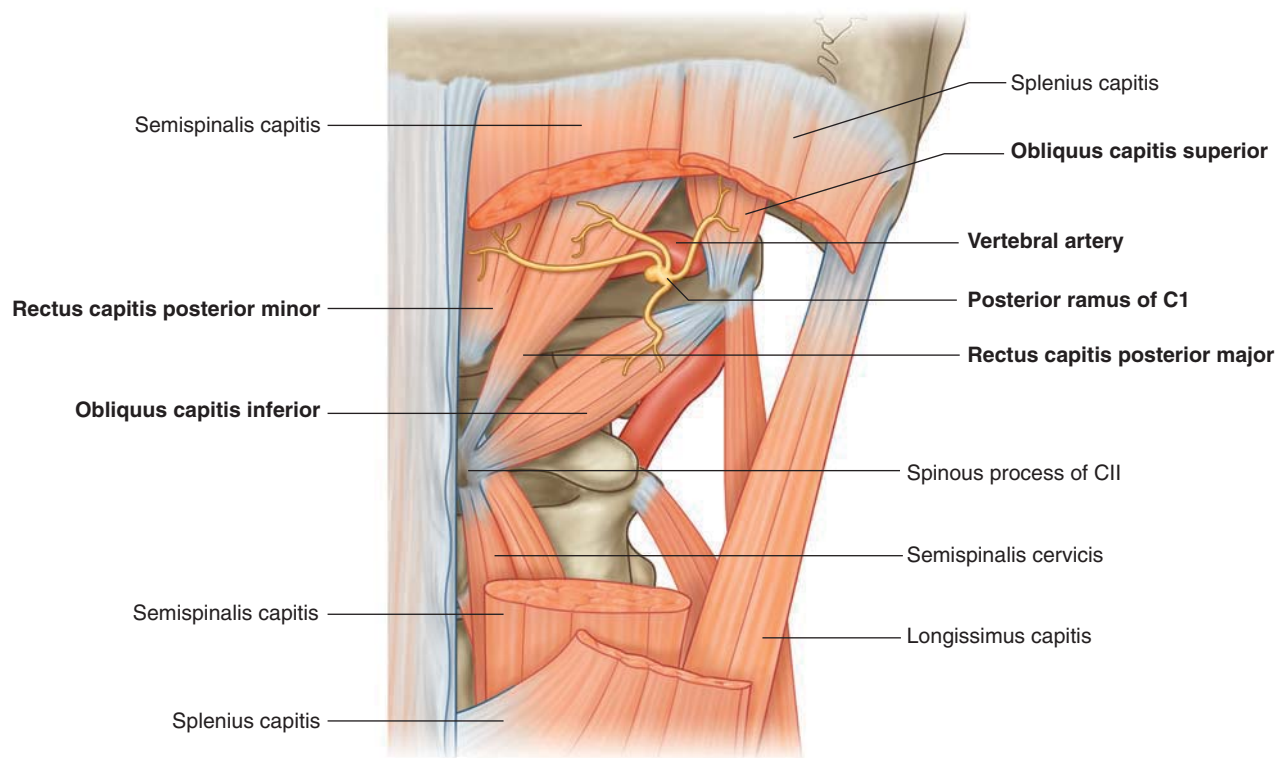


Fig. 2.52 Deep group of back muscles—suboccipital muscles. This also shows the borders of the suboccipital triangle.

Table 2.7 Suboccipital group of back muscles

Muscle	Origin	Insertion	Innervation	Function
Rectus capitis posterior major	Spinous process of axis (CII)	Lateral portion of occipital bone below inferior nuchal line	Posterior ramus of C1	Extension of head; rotation of face to same side as muscle
Rectus capitis posterior minor	Posterior tubercle of atlas (CI)	Medial portion of occipital bone below inferior nuchal line	Posterior ramus of C1	Extension of head
Obliquus capitis superior	Transverse process of atlas (CI)	Occipital bone between superior and inferior nuchal lines	Posterior ramus of C1	Extension of head and bends it to same side
Obliquus capitis inferior	Spinous process of axis (CII)	Transverse process of atlas (CI)	Posterior ramus of C1	Rotation of face to same side