



CHAPTER**6**

"The spinal column is a long bunch of bones. The head sits on the top, and you sit on the bottom."

—A child, on a test

The Vertebral Column

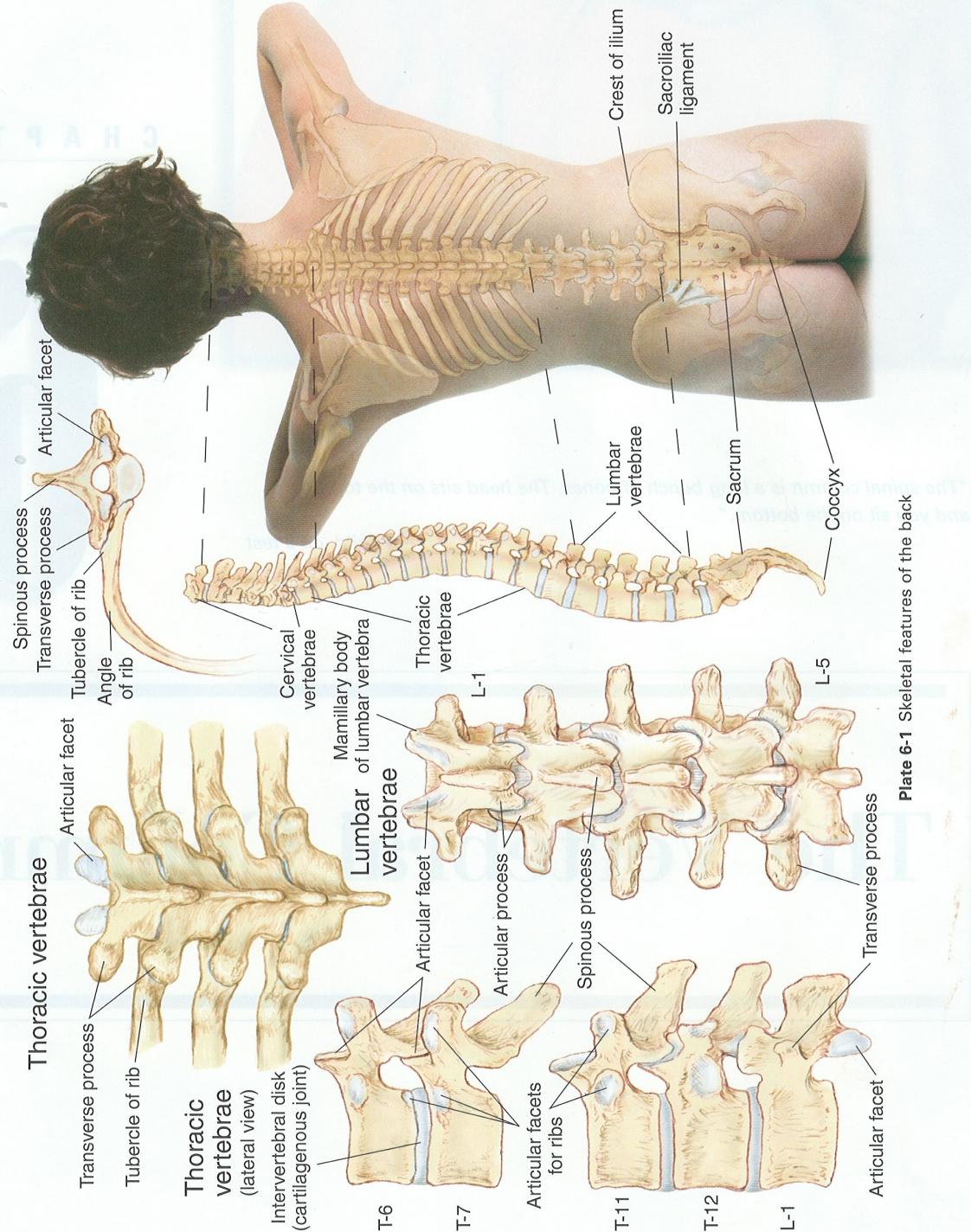


Plate 6-1 Skeletal features of the back

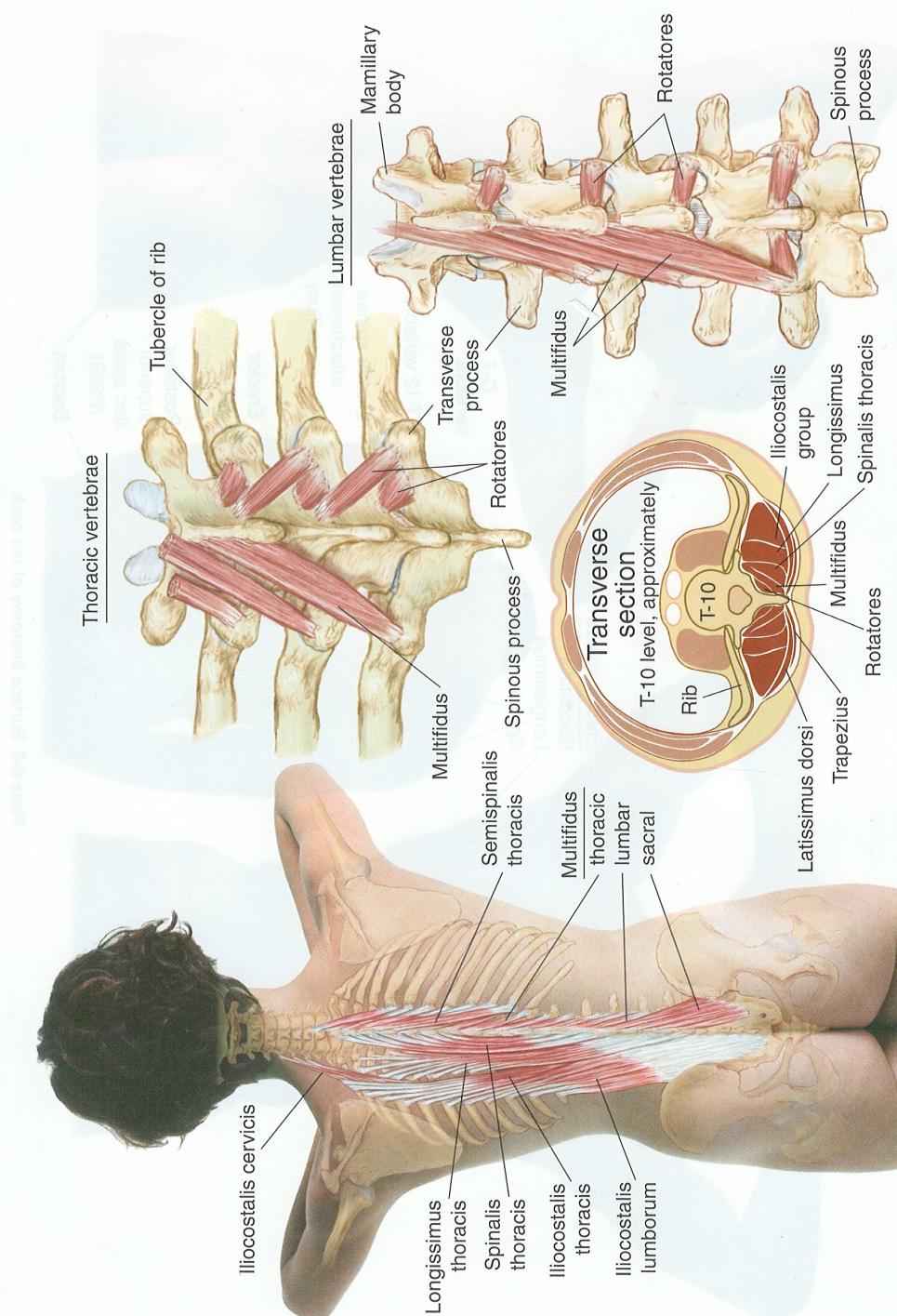


Plate 6-2 Muscles of the back

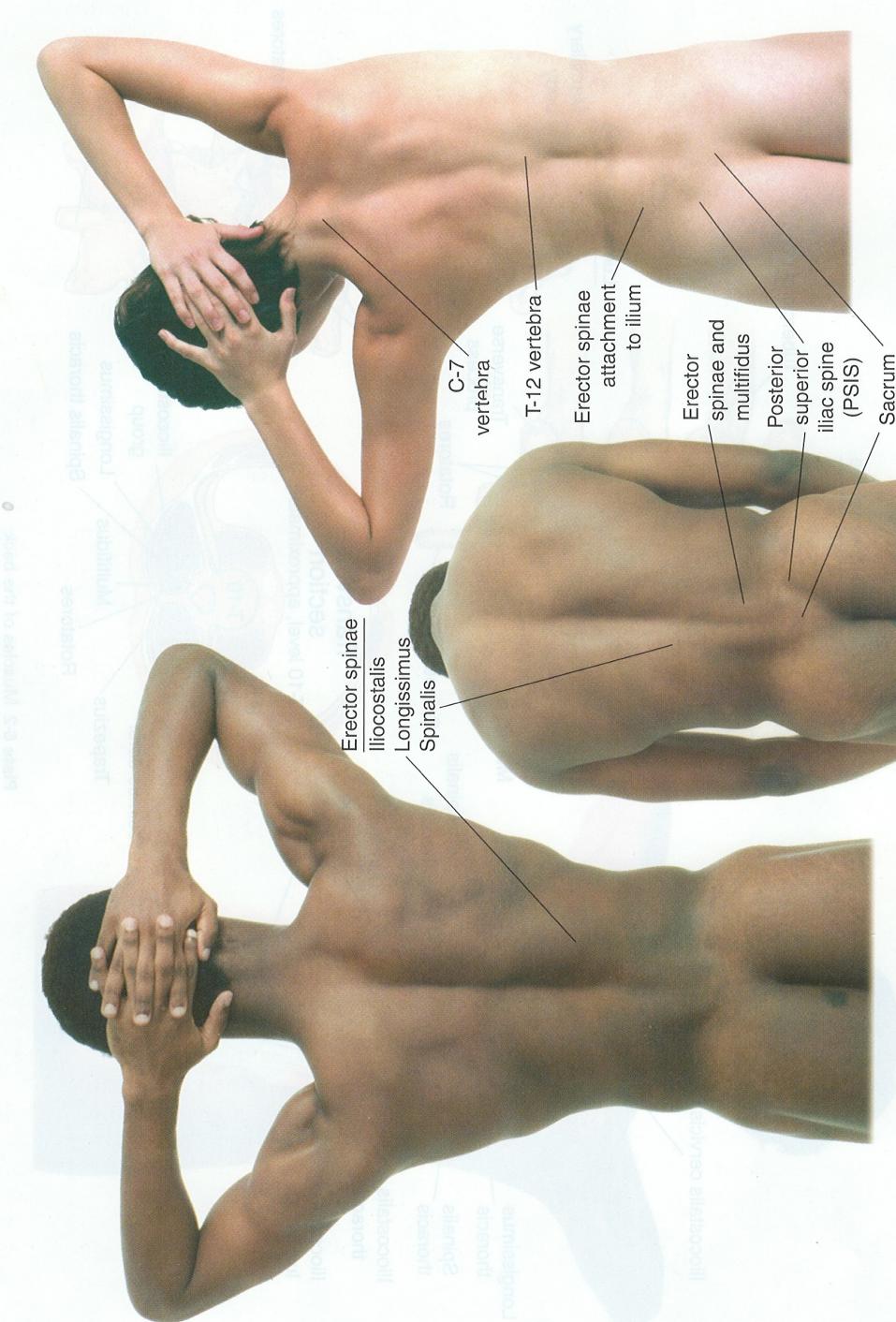


Plate 6-3 Surface anatomy of the back

OVERVIEW OF THE REGION



The vertebral column, or spine, is divided into five regions:

- The cervical spine, with seven vertebrae (C1 through C7)
- The thoracic spine, with twelve vertebrae and attached ribs (T1 through T12)
- The lumbar spine, with five vertebrae (L1 through L5)
- The sacrum, with five fused vertebrae
- The coccyx, usually consisting of four vertebrae

Though similar in basic structure and function, the vertebrae vary considerably in size and shape in the different regions, the cervical vertebrae being the smallest and the lumbar vertebrae being the largest.

At birth the spine has a single posterior curvature forming the typical "C" shape of the newborn infant. As the child begins to hold the head erect, sit up, and learn to stand, additional spinal curvatures develop. The five regions of the adult spine include four normal curvatures. The cervical and lumbar regions have an anterior curvature while the thoracic, sacral and coccygeal regions retain their original posterior curvature. Excessive increases or decreases in these curves (**kyphosis, lordosis**) threatens postural integrity, and their restoration and maintenance is one of the aims of posturally oriented bodywork.

There are two types of joints between most of the vertebrae of the spine:

- Cartilaginous joints between the broad vertebral body of adjoining vertebrae, comprised of fibrocartilage surrounding a gel-filled disk that supports most of the weight
- Synovial facet joints between articular processes that guide most of the movement

There are two facet joints on each side, articulating with the facets of the two adjoining vertebrae. In addition, the thoracic vertebrae also articulate with the ribs and accordingly have facets for those joints.

These joints and the variations in shape between vertebrae of different regions determine the type and range of movement of the spine. These movements are:

- Anterior flexion
- Lateral flexion (sometimes called lateral bending)
- Extension (and hyperextension)
- Rotation

The cervical region is the only one capable of the full range of spinal movement. All other regions are limited in one or more movements. The spinous processes of the thoracic vertebrae are angled sharply in an inferior direction and prevent hyperextension of this region in most individuals. The planes of the articular facets of the lumbar region are nearly vertical and thus limit rotation. Since the vertebrae are usually fused in the sacrum and coccyx by eighteen to thirty years of age (and for all practical purposes much earlier), there is no movement possible within those regions, although they do move relative to adjoining regions. Note that the coccyx is joined to the sacrum by ligaments, and can move in relation to it in response to pressure.

Comment

The directional terms "**cephalad**" (toward the head) and "**caudad**" (toward the tail, i.e., coccyx) are used in this chapter.

Etymology

- Greek *kephal*, head
- Latin *cauda*, tail

It is helpful to do some general work on the back before treating specific areas in order to stimulate local blood flow and relax the superficial musculature. This may include effleurage, petrissage, kneading, and percussion, but be careful not to use excessive lubrication, as it will hinder work in specific areas afterwards. One helpful technique for preparatory treatment of the back is myofascial stretching (see Chapter 1, page 12).



Manual Therapy

MYOFASCIAL STRETCHING FOR THE BACK

- The client lies supine.
- The therapist stands beside the client at the torso.
- Place the hand nearest the client's head flat on the lumbar area lateral to the vertebrae with the fingers over the iliac crest just lateral to the sacrum.
- Crossing the other hand over or under the first, place it flat on the thoracic area over the lowest three or four ribs.
- Let your hands sink into the tissue until you feel contact with the superficial fascia.
- Press the hands in opposite directions, with enough downward pressure to engage and stretch the superficial fascia (Fig. 6-1).



- Hold until you feel significant release in the fascia.
- Shift both hands laterally (toward yourself) by one hand's width and repeat the technique.
- Shift the hands cephalad, so that the caudad hand rests on the lower three or four ribs and the cephalad hand rests on the third through the sixth ribs, both hands just lateral to the vertebrae.
- Repeat the technique.
- Repeat the technique at this level shifting the hands laterally.
- Repeat the entire procedure on the opposite side.

Figure 6-1 Myofascial stretch for the back (Draping option 7)

THE SUPERFICIAL PARASPINAL MUSCLES

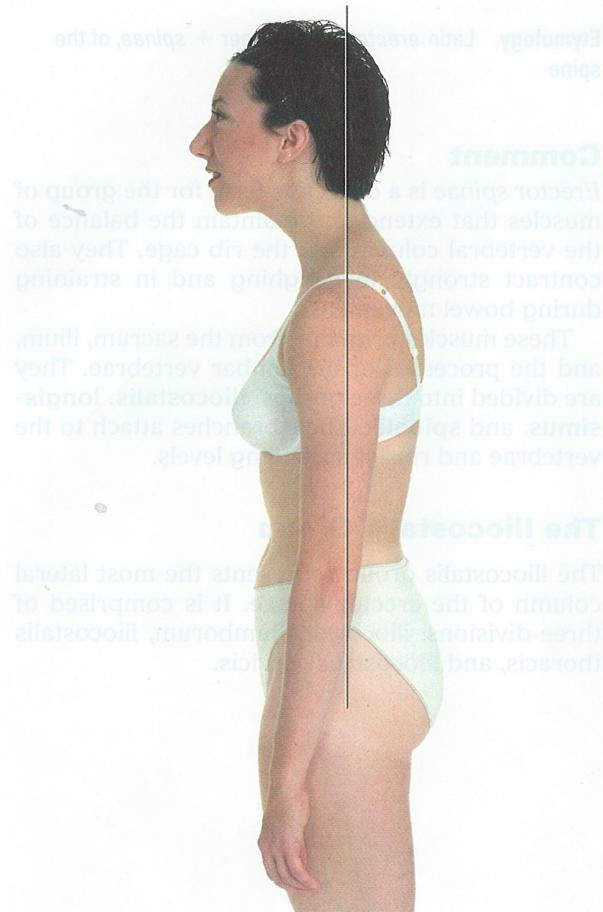


Figure 6-2 Posture with head forward and shoulders medially rotated

We need to keep two facts in mind when viewing the vertebral column in the context of the whole body:

- The center of gravity of the body is in the pelvic region, well forward of the spine.
- As we noted in Chapter 4 (page 117), the entire arm and shoulder structure is attached to the skeleton by only one joint, the sternoclavicular joint, also well forward of the spine.

The implication of these two facts is that the spine and the muscles that attach to it must maintain the integrity of the posture against a strong anterior pull. Because of the location of our eyes and the construction of our shoulders and arms, virtually everything that we human beings do requires us to move our heads, arms, and torsos forward, down, and inward. It is the task of the superficial muscles of the vertebral column (along with the muscles of the low back) to counterbalance us in such activities. Poor posture—that is, posture in which the head is carried forward of the sagittal midline, the shoulders are medially rotated, and the anterior intercostal and abdominal muscles are habitually shortened (Fig. 6.2)—places a severe strain on the superficial muscles of the spine and posterior neck, resulting in the development of active trigger points and pain. Although, according to David G. Simons, MD, “there are no hard scientific data as to when and how latent MTrPs [myofascial trigger points] start,”¹ we do know that “by correcting the postural problem the MTrP either clears up or is much more treatable.”²

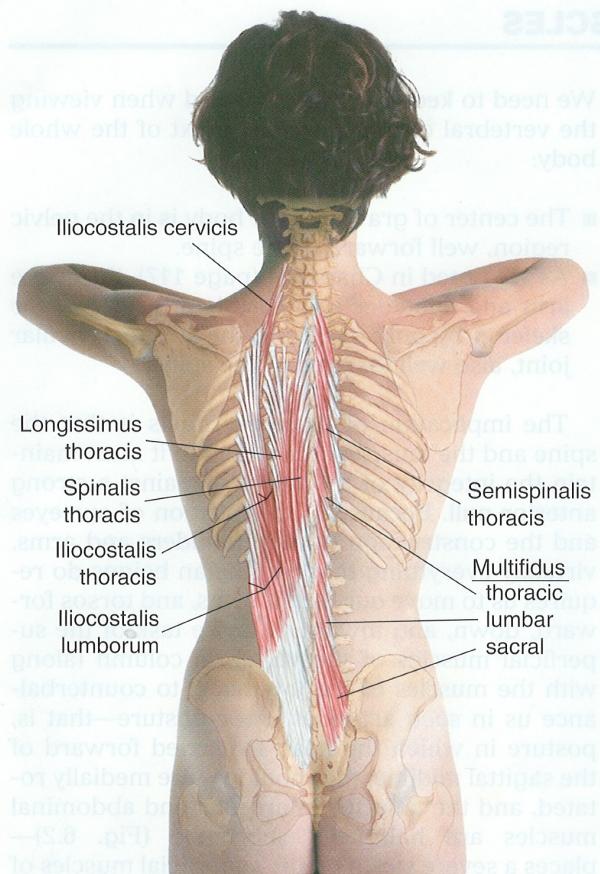


Figure 6-3 Anatomy of the erector spinae muscles

Erector Spinae (Fig. 6-3)

e-RECK-ter SPEE-nay

Etymology Latin *erector*, straightener + *spinae*, of the spine

Comment

Erector spinae is a collective term for the group of muscles that extend and maintain the balance of the vertebral column and the rib cage. They also contract strongly in coughing and in straining during bowel movements.

These muscles originate from the sacrum, ilium, and the processes of the lumbar vertebrae. They are divided into three groups: **iliocostalis**, **longissimus**, and **spinalis**. Their branches attach to the vertebrae and ribs at ascending levels.

The Iliocostalis Group

The iliocostalis group represents the most lateral column of the erector spinae. It is comprised of three divisions: iliocostalis lumborum, iliocostalis thoracis, and iliocostalis cervicis.

Iliocostalis Lumborum (Fig. 6-4)

ILL-ee-oh-kos-TAL-is lum-BOR-um

Etymology Latin *ilio-*, relating to the ilium + *costalis*, relating to the ribs (*costa*, rib) + *lumborum*, of the loins



Attachments

- Inferiorly, from sacrum and ilium
- Superiorly, to the inferior borders of the lower six ribs



Action

Extends, laterally flexes, and rotates lumbar vertebrae



Referral Area

Over the lumbar region into the center of the buttock



Other Muscles to Examine

Iliocostalis thoracis, longissimus, quadratus lumborum, gluteals, piriformis and other lateral hip rotators



Manual Therapy

STRIPPING

- The client lies supine.
- The therapist stands beside the client at the torso.
- Place the knuckles on the muscles at the waist of the client just lateral to the lumbar vertebrae.
- Pressing firmly into the tissue, slide the knuckles inferiorly over the sacrum to its base (Fig. 6-5).
- Repeat the procedure on the opposite side.

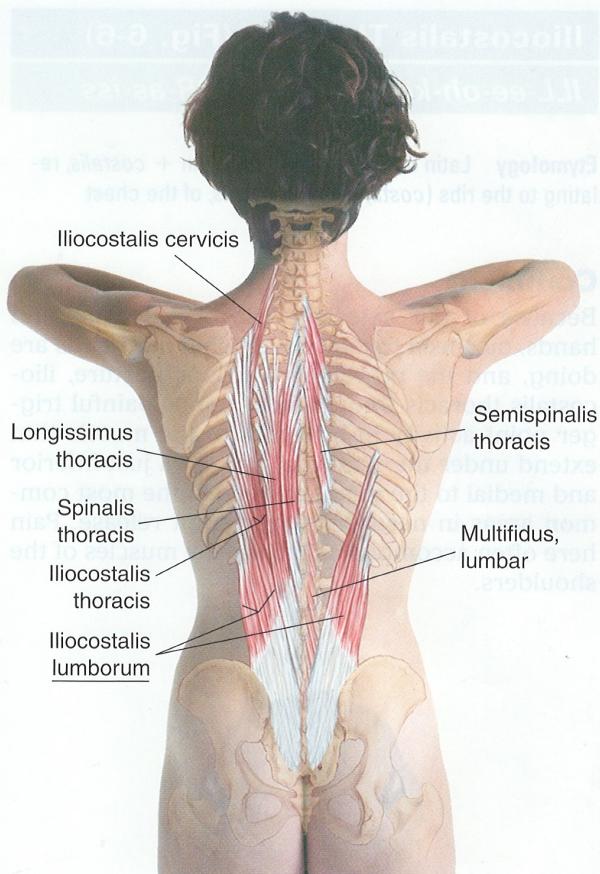


Figure 6-4 Anatomy of iliocostalis lumborum

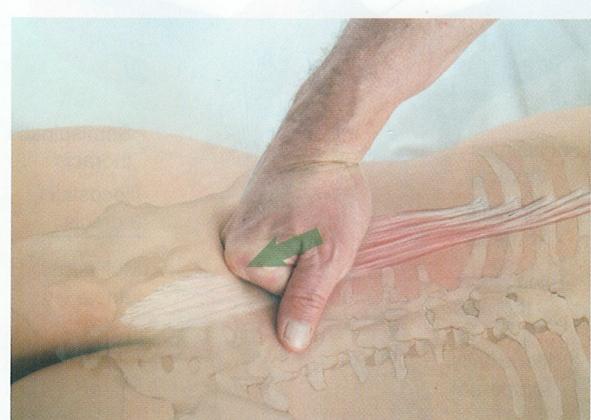


Figure 6-5 Stripping of origins of iliocostalis lumborum (Draping option 7)

Iliocostalis Thoracis (Fig. 6-6)

ILL-ee-oh-kos-TAL-is THOR-as-iss

Etymology Latin *ilio-*, relating to the ilium + *costalis*, relating to the ribs (*costa*, rib) + *thoracis*, of the chest

Comment

Because of our extensive use of our arms and hands, our need to look down what our hands are doing, and the prevalence of poor posture, iliocostalis thoracis frequently develops painful trigger point activity in branches of the muscle that extend under the scapulae. This area just inferior and medial to the scapula is one of the most common areas in need of trigger point release. Pain here often accompanies pain in the muscles of the shoulders.

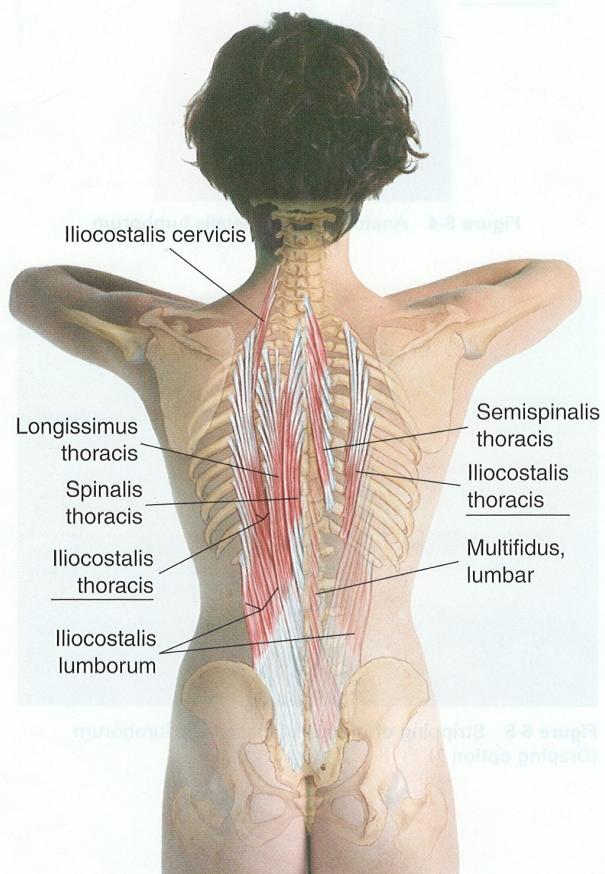


Figure 6-6 Anatomy of iliocostalis thoracis

Attachments

- Inferiorly, to the medial side of the inferior borders of the lower six ribs
- Superiorly, to the inferior borders of the upper six ribs

Action

Extends, laterally flexes, and rotates thoracic vertebrae

Referral Area

- Inferior angle of the scapula, inside the medial border of the scapula to the superior angle; anterior chest over the angle of the sternum and the costal arch
- Over the lumbar region, into the lateral inferior thoracic region, up across the scapula; lower ipsilateral quadrant of the abdomen

Other Muscles to Examine

- Trapezius, rotator cuff muscles, teres major, rhomboids
- Pectoralis major, intercostals
- Serratus posterior inferior, quadratus lumborum, iliocostalis lumborum
- Abdominal obliques, iliopsoas

Manual Therapy

STRIPPING

- The client lies supine.
- The therapist stands beside the client at the head.
- Palpate for a distinct muscular band running diagonally in a superolateral direction under the inferomedial border of the scapula. Explore this band just inferior to the scapula for tenderness.
- Place the supported thumb on the tender spot and press firmly into the tissue.
- Glide the thumb diagonally along the muscle to the erector bundle (Fig. 6-7).
- Beginning at the same spot, repeat this procedure two or three times.

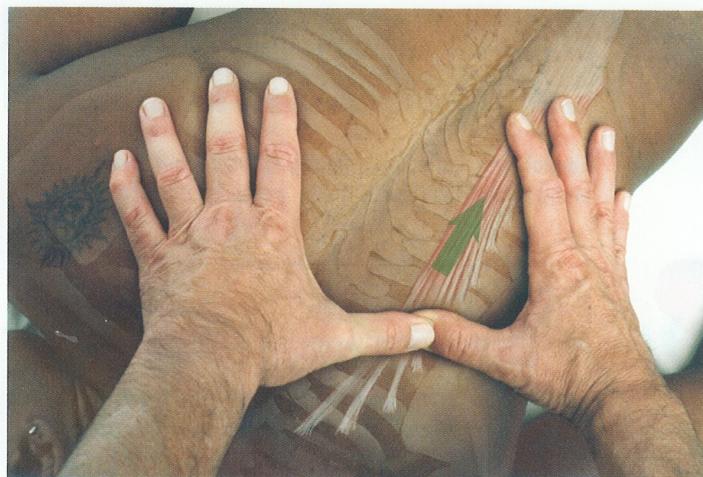


Figure 6-7 Stripping of iliocostalis thoracis with supported thumb



Figure 6-8 Cross-fiber stroking of iliocostalis thoracis with heel of hand (A) or knuckles (B)

CROSS-FIBER STROKING

- The client lies supine.
- The therapist stands beside the client at the head.
- Place the hand (Fig. 6-8A) or the knuckles (Fig. 6-8B) on the upper back medial to the superior angle of the scapula.
- Pressing firmly into the tissue with the heel of your hand or your knuckles, slide your hand diagonally along the medial border of the scapula past the inferior angle.
- Beginning at the same spot, repeat this procedure two or three times.

CROSS-FIBER FRICTION

- The client lies supine.
- The therapist stands beside the client at the head.
- Place the fingertips or the knuckles next to the muscular band at the inferomedial border of the scapula.
- Move the fingertips or knuckles back and forth across the band at a rate of about twice per second.
- Continue until you feel release in the tissue.

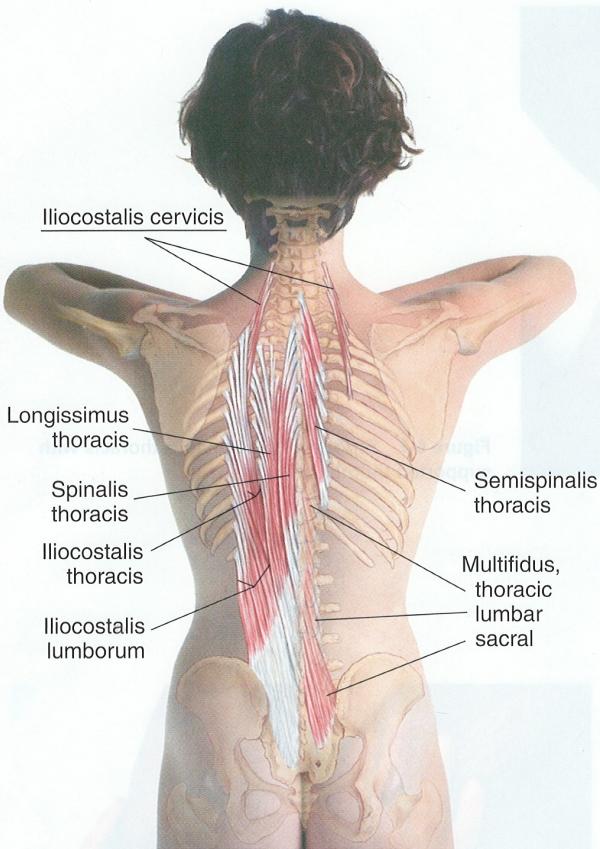


Figure 6-9 Anatomy of iliocostalis cervicis

Iliocostalis Cervicis (Fig. 6-9)

ILL-ee-oh-kos-TAL-is SERV-iss-iss

Etymology Latin *ilio-*, relating to the ilium + *costalis*, relating to the ribs (*costa*, rib) + *cervicis*, of the neck

Attachments



- Inferiorly, to the superior borders of the upper six ribs
- Superiorly, to the transverse processes of the middle cervical vertebrae

Action



Extends, laterally flexes, and rotates cervical vertebrae

Comment

No trigger points have been recorded for this muscle; it is included here for completeness.

Longissimus Thoracis (Fig. 6.10)

long-GISS-i-mus THOR-as-iss

Etymology Latin, *longissimus*, longest + *thoracis*, of the chest



Attachments

- Inferiorly, to the transverse processes of the lumbar vertebrae
- Superiorly, to the tips of the transverse processes of all thoracic vertebrae and the last nine or ten ribs between their tubercles and angles



Action

- Extends vertebral column



Referral Area

Over the lumbar region into the superior aspect of the buttock; over the buttock to the inferior aspect



Other Muscles to Examine

- Serratus posterior inferior
- Quadratus lumborum
- Iliocostalis lumborum and thoracis
- Gluteal muscles
- Piriformis and other lateral rotators
- Hamstrings

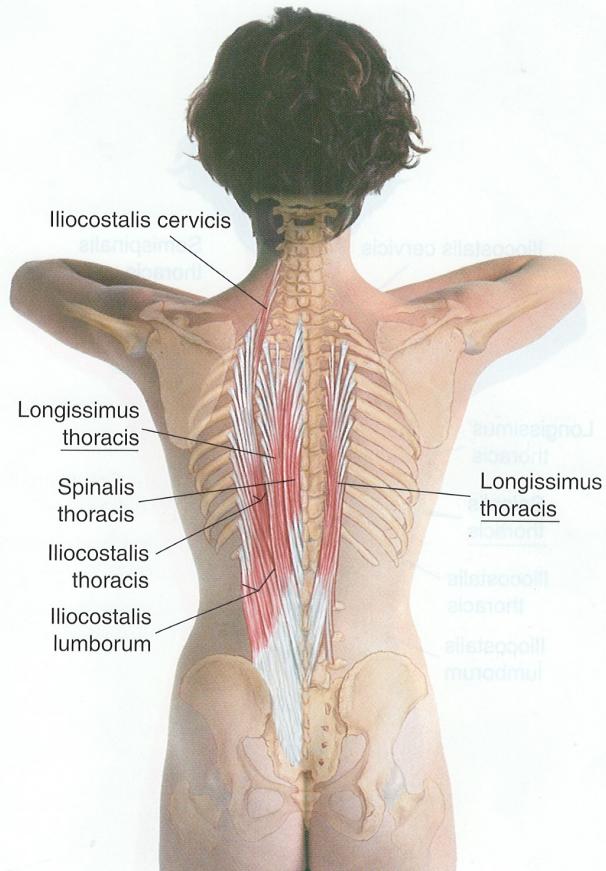


Figure 6-10 Anatomy of longissimus thoracis



Manual Therapy

See Manual Therapy for the Erector Spinae, below.

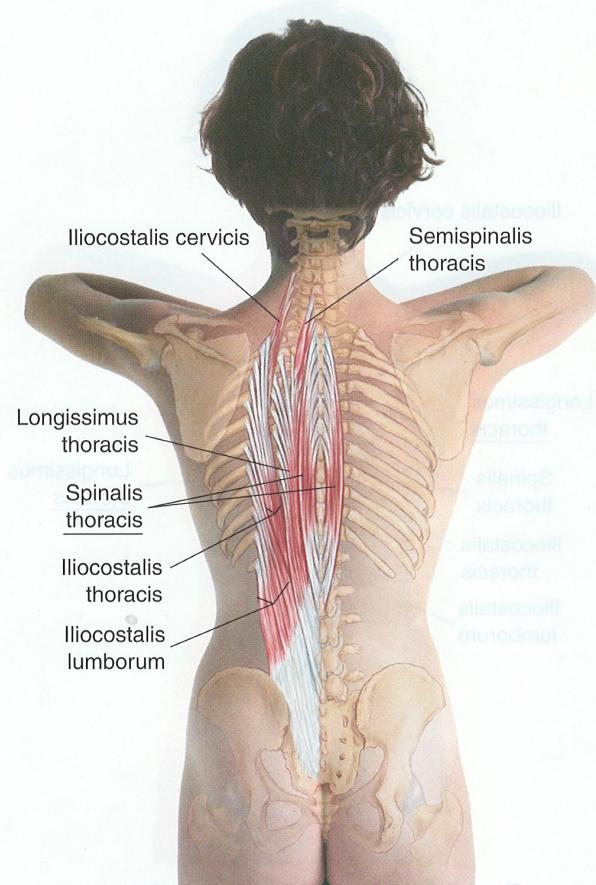


Figure 6-11 Anatomy of spinalis thoracis

Spinalis Thoracis (Fig. 6-11)

spin-AL-iss THOR-as-iss

Etymology Latin *spinalis*, relating to the spine

Attachments

- Inferiorly, to the spinous processes of the upper lumbar and two lower thoracic vertebrae
- Superiorly, to the spinous processes of middle and upper thoracic vertebrae

Action

Supports and extends the vertebral column

Referral Area

None recorded

Other Muscles to Examine

Not applicable

Manual Therapy

See Manual Therapy for the Erector Spinae, below.

Semispinalis Thoracis (Fig. 6-12)

SEM-i-spin-AL-iss THOR-as-iss

Etymology Latin *semi*, half + *spinalis*, relating to the spine + *thoracis*, of the chest



Attachments

- Inferiorly, to the transverse processes of the fifth to eleventh thoracic vertebrae
- Superiorly, to the spinous processes of the first four thoracic and fifth and seventh cervical vertebrae



Action

Extends vertebral column.

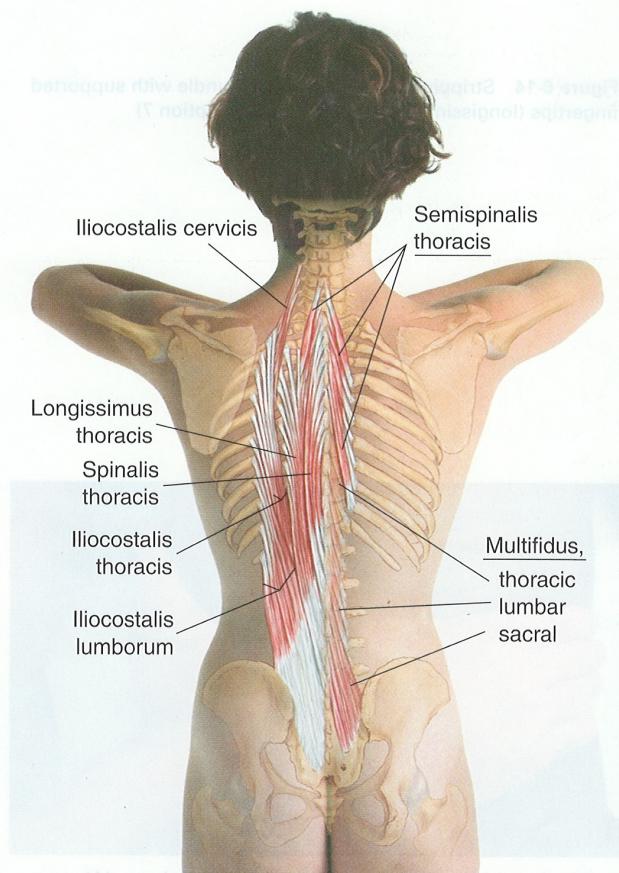


Figure 6-12 Anatomy of semispinalis thoracis



Referral Area

None recorded



Other Muscles to Examine

Not applicable



Manual Therapy for the Erector Spinae

Because the erector spinae muscles are gathered together in a paraspinal bundle, they can most easily be treated as a group. Stripping massage may be applied in either a caudad or cephalad direction. It is helpful to do both, as different trigger points may be accessed in each direction. You may use the hand, thumb, knuckles, fingertips, or elbow.

STRIPPING

- The client lies supine.
- The therapist stands beside the client at either the head or shoulder (to work in a caudad direction) or at the hips (to work in a cephalad direction).
- Place the heel of the hand (Fig. 6-13), the supported fingertips (Fig. 6-14), the supported thumbs (Fig. 6-15), the knuckles (Fig. 6-16), or the elbow (Fig. 6-17) on the muscle bundle near C7 (to work caudad) or at the sacrum (to work cephalad).
- Pressing firmly into the tissue, slide the body part you are using along the entire length of the muscle bundle.



Figure 6-13 Stripping of erector spinae bundle with heel of hand (longissimus is shown)

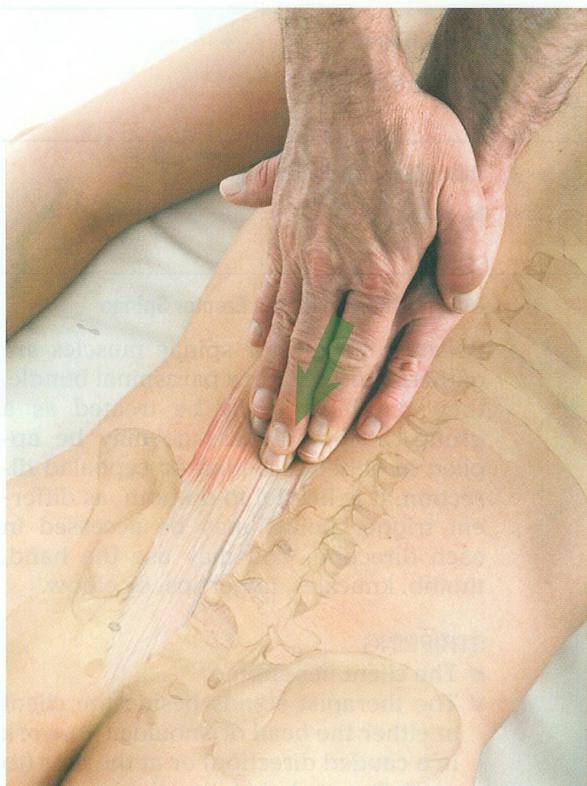


Figure 6-14 Stripping of erector spinae bundle with supported fingertips (longissimus is shown) (Draping option 7)

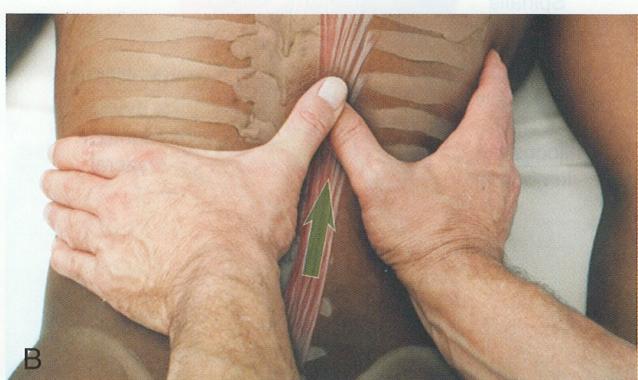


Figure 6-15 Stripping of erector spinae bundle with supported thumb both caudad and cephalad, showing longissimus. (A) starting position stripping caudad, (B) midway position stripping cephalad

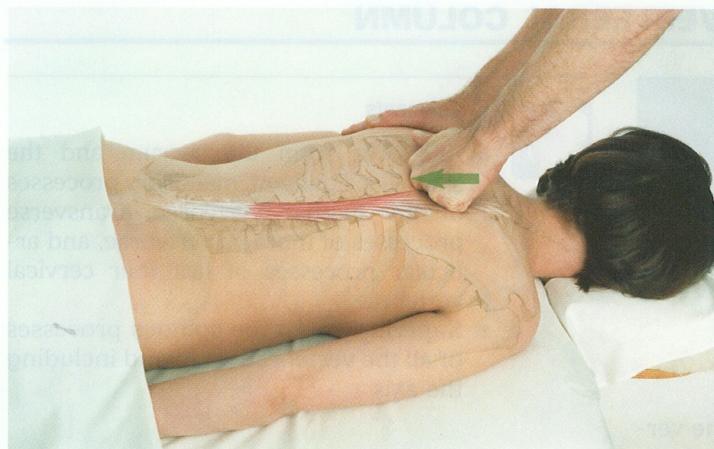
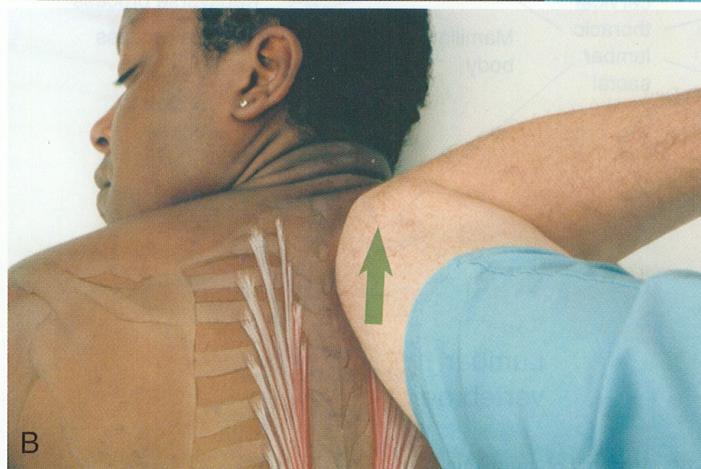


Figure 6-16 Stripping of erector spinae bundle with knuckles, showing longissimus



A



B

Figure 6-17 Stripping of erector spinae bundle with elbow, showing longissimus. (A) starting point, (B) ending point (Draping option 7)

THE DEEP MUSCLES OF THE VERTEBRAL COLUMN

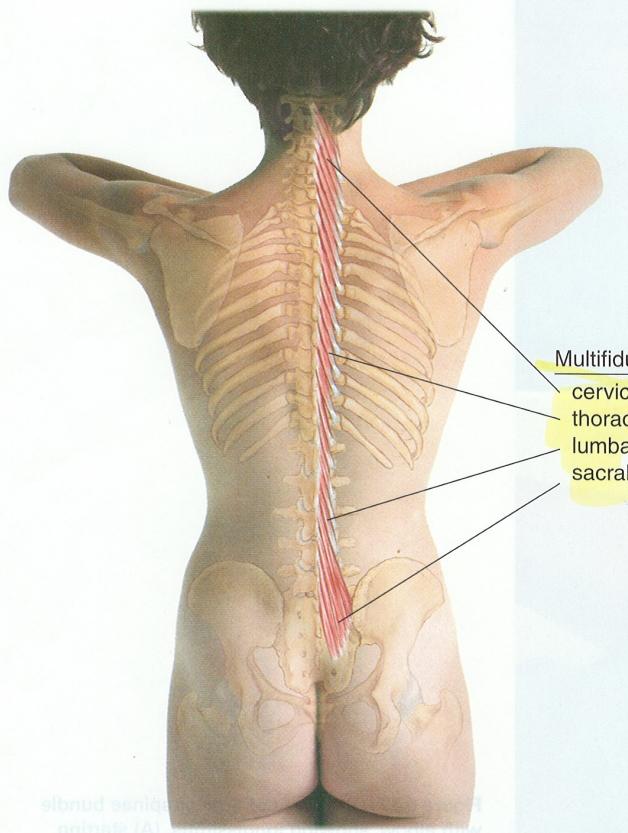
Multifidus (Plural *Multifidi*) (Fig. 6-18)

mul-TIFF-i-duss

Etymology Latin *multi*, many + *fidus*, divided, thus “divided into many segments.”

Comment

This group of muscles is located all along the vertebral column, from the cervical region to the base of the spine. The lower segments of multifidus that reach from the sacrum to the lumbar vertebrae are very strong and prominent, resembling the stays on the mast of a sailboat. In fact multifidus is one of the strongest muscles in the body. You will frequently find tenderness over the sacrum in clients with low back pain.



Attachments

- Inferiorly, from the sacrum and the sacroiliac ligament, mamillary processes of the lumbar vertebrae, transverse processes of thoracic vertebrae, and articular processes of last four cervical vertebrae
- Superiorly, into the spinous processes of all the vertebrae up to and including the axis



Action

Extends, rotates, and stabilizes the vertebral column

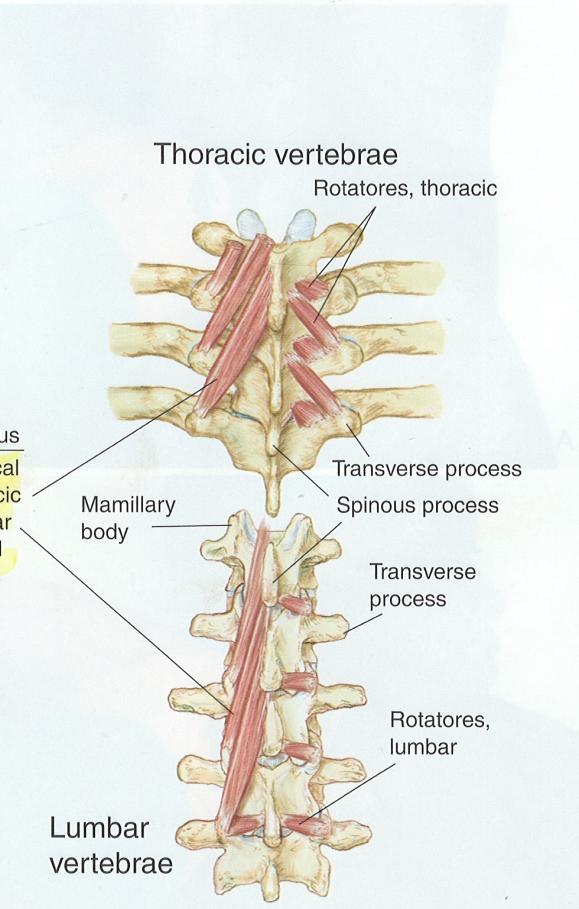


Figure 6-18 Anatomy of multifidus

**Referral Area**

- Between the vertebral column and the medial border of the scapula
- The region just lateral to T12 and L1, and over the lumbar region; upper lateral quadrant of the abdomen
- Over the sacrum, into the buttock along the gluteal cleft, into the posterior thigh below the buttock; lower lateral quadrant of the abdomen
- Around the coccyx

**Other Muscles to Examine**

- Iliocostalis thoracis, rhomboids
- Quadratus lumborum, serratus posterior inferior, iliocostalis thoracis and lumborum
- Rectus abdominis, iliopsoas

- Gluteal muscles, hamstrings
- Abdominal obliques, iliopsoas
- Levator ani

Manual Therapy**STRIPPING**

- The client lies prone.
- The therapist stands at the client's side at the chest, facing caudad.
- Place the fingertips (Fig. 6-19A) or thumb (Fig. 6-19B), supported or unsupported, at the superior aspect of the sacrum just lateral to the spinal column, pointing caudad (inferiorly).
- Pressing firmly into the tissue, glide the thumb or fingertips caudad as far as the inferior aspect of the sacrum.
- Repeat this technique on the other side.



Figure 6-19 Stripping of multifidus at inferior attachments with fingertips (A) and thumb (B) (Draping option 7)

Rotatores (Fig. 6-20)

RO-ta-TOR-ace

Etymology Latin *rotatores*, rotators

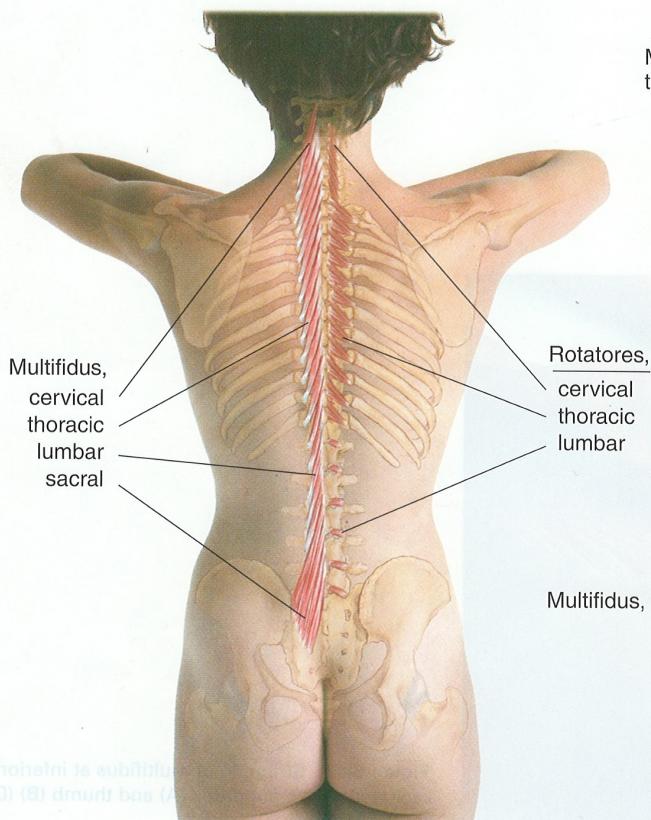
Comment

Rotatores are the deepest of the three layers of transversospinalis muscles, chiefly developed in the thoracic region. Because they have a very high density of muscle spindles, they probably function as organs of proprioception. Their motor function appears to be in fine adjustments rather than gross movements of the spine.

Attachments



- Inferiorly, from the transverse process of one vertebra
- Superiorly, into the root of the spinous process of the next two or three vertebrae above



Action

- Bilaterally, extension of the spine
- Unilaterally, rotation of the vertebrae
- Proprioception

Referral Area

Along the midline of the spine

Other Muscles to Examine

Other superficial and deep paraspinal muscles

Manual Therapy for Multifidi and Rotatores

CROSS-FIBER STROKING

- The client lies prone.
- The therapist stands at the client's side, beginning at the waist.

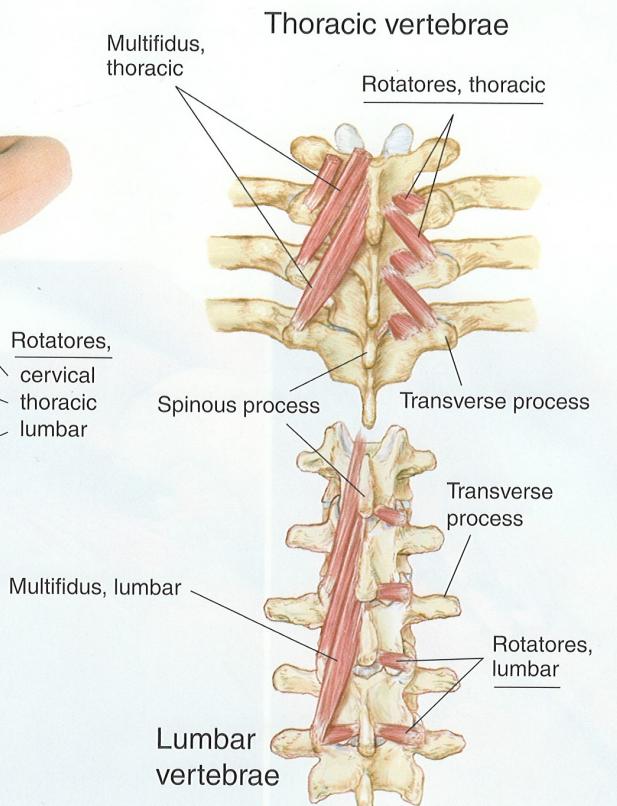


Figure 6-20 Anatomy of rotatores



Figure 6-21 Cross-fiber stroking of rotatores in lumbar region using thumb (Draping option 7)

- Place the thumb or fingertip (supported or unsupported) on the space between the spinous process of L5 and the sacrum (Fig. 6-21).
- Press laterally (away from yourself) and diagonally caudad, pushing the superficial muscles out of the way to reach the intrinsic muscles.
- If the client reports tenderness, hold for release.
- Shifting cephalad, repeat this technique between each two spinous processes as far as the space between T12 and L1.
- Beginning with the space between T11 and T12, perform the same technique gliding the thumb into the space between the ribs.
- Repeat this technique (Fig. 6-22) as far as C7.
- From C7 to the cranial base, use your unsupported thumb.



Caution

- Use this technique with great care in the cervical region, and only after other work has been performed in that area as described in Chapter 3 to release the more superficial posterior neck muscles.
- This technique is contraindicated in any area of the spine where there is diagnosed or suspected spinal pathology.
- When using this technique, get regular feedback from the client regarding any local or referred pain or other sensation.



Figure 6-22 Cross-fiber stroking of rotatores in thoracic region using support fingertips (Draping option 7)

REFERENCES

- ¹ Simons DG, Travell JG, Simons LS: *Travell & Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual*. Lippincott, Philadelphia, 1999.

