Condition Specific Massage Therapy

SECOND EDITION

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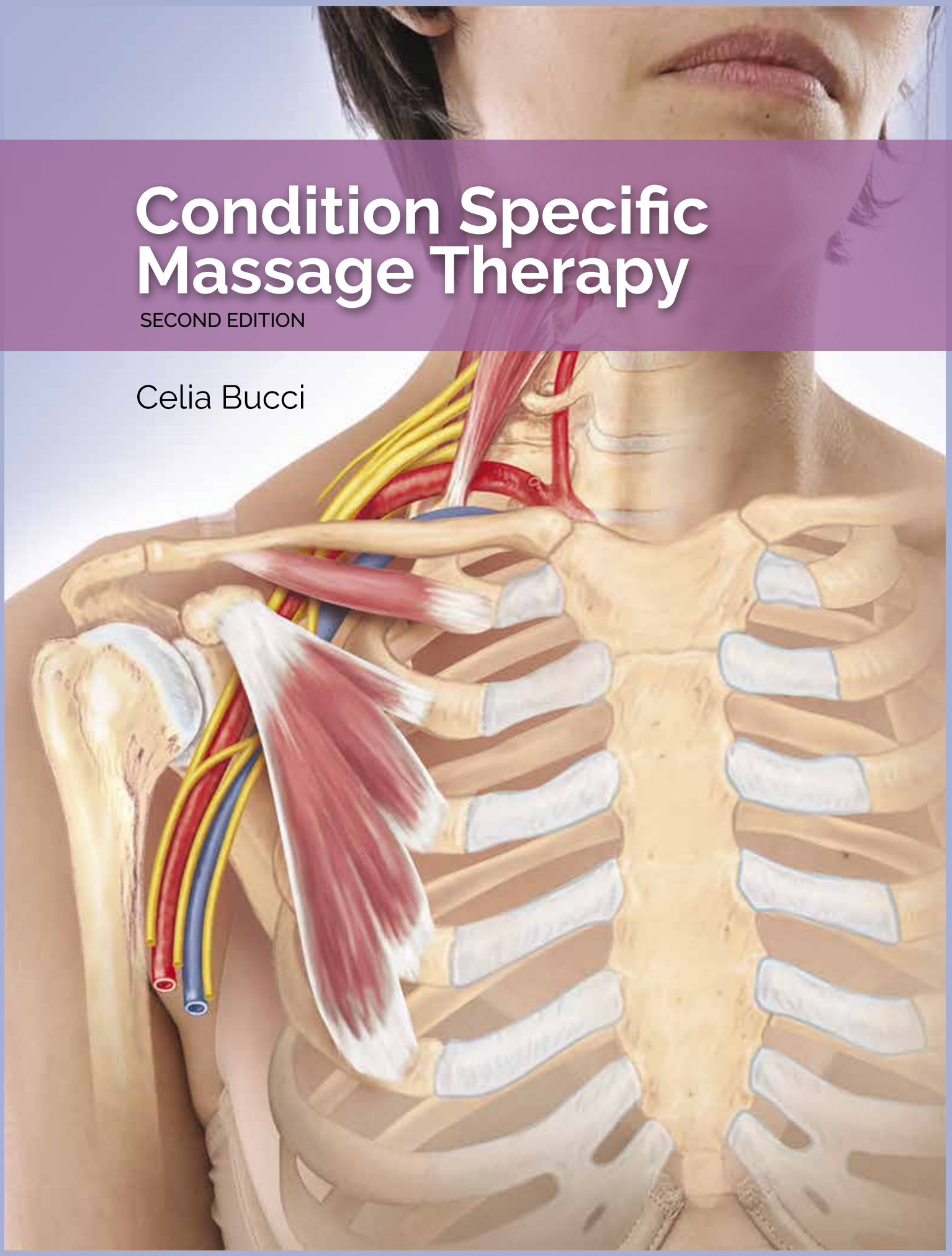


Chapter 8:

Hyperlordosis

(Low Back Pain)

Hyperlordosis

Understanding Hyperlordosis

A healthy spine has four natural curves (Fig. 1). The two lordotic curves—cervical and lumbar—arc anteriorly. The two kyphotic curves—thoracic and pelvic—arc posteriorly. These curves are ideal for our species to maintain balance, absorb the impact of movement, and to allow maximum flexibility for our particular types of activity.

Hyperlordosis is an increase in the natural lordotic curve. This chapter focuses on lumbar hyperlordosis: an increased lumbar lordotic curve most often accompanied by shortened hip flexors, anterior pelvic tilt, and shortened lumbar extensors with weakened hamstrings and abdominals (Fig. 2). With the hips flexed, such as when sitting, the hip flexors are shortened. If this is a person's common posture, held for hours at a time, day after day, the muscles may develop a high resting tone, making it difficult to lengthen the muscle fully when necessary. As the individual extends the hips, such as when standing from the seated posture, the shortened psoas draws the lumbar vertebrae to which it attaches anteriorly, increasing the lumbar curve, while the iliacus and rectus femoris pull on the pelvis and tilt it anteriorly. The anterior pelvic tilt lengthens and weakens the hamstrings because the distance between the ischium and tibia is increased. The abdominals, which primarily function to maintain posture, weaken and fatigue against the force of the shortened, hypertonic muscles and the associated postural dysfunction. The anterior pelvic tilt and increased lordotic curve decrease the distance between the iliac crests and the ribcage, shortening the lumbar extensors, which may also become hypertonic when they are recruited to maintain an erect posture because the abdominals are not fully able to do so.

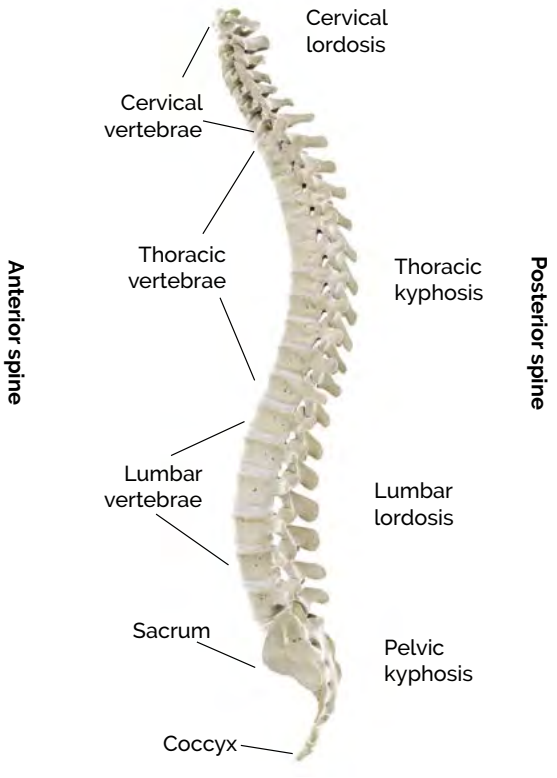


Figure 8-1 Curves of the spine.
Image Credit: SciePro/Shutterstock

Figure 8-2 Anterior pelvic tilt.

In a very short period relative to our evolution, human lifestyle has changed from being highly physical—hunting and gathering, walking, performing manual labor, and so on—to becoming increasingly sedentary. We spend a lot of time driving, sitting, working at a computer, watching television, and so on. These static postures put many of the body's joints in flexion. The hips, knees, thorax, and shoulders are nearly immobile for hours at time. Because of this, hyperkyphosis and hyperlordosis have become two very common postural deviations that lead to chronic pain and limited ROM along the spine and in the shoulders and hips. Both of these postures may lead to other conditions, but you may find that normalizing the curves of the spine and leveling the ilia and scapulae will reduce this client's pain and restriction and may facilitate your treatment of accompanying conditions.

FUNCTIONAL VS. STRUCTURAL POSTURAL IMBALANCE

The hyperlordosis described above is functional. Its cause is primarily soft tissue changes and postural deviations that result from an injury to the low back, pelvis, or hip joint or, more commonly, from activities of daily living and poor posture. These deviations can be treated with manual therapy, self-care, and postural awareness. The therapeutic goal for a client with functional hyperlordosis is to lengthen the muscles that have shortened and become hypertonic and that are pulling the bones out of alignment; to strengthen the muscles that have stretched and become weak; and to reset the neuromuscular system to recognize proper posture and diaphragmatic breathing as normal.

A structural hyperlordotic curve, in contrast, is primarily caused by changes in bones and joints. Bone fusions, bony prominences, bone spurs, fractured bones that were not properly set, osteoporosis, and degenerative disc disease are a few contributing factors. Manual therapy may offer this client pain relief, small increases in ROM, and may slow the progression of postural imbalance but is unlikely to reverse the dysfunction. When hyperlordosis is structural in nature, it is best to discuss the client's condition with their health care provider to fully understand the causes. You may need to modify positioning, bolstering, length of treatment, and techniques to accommodate the client's particular needs. In some cases, massage may be contraindicated.

MUSCLES OF THE LOWER CROSS

Lumbar hyperlordosis is also called lower cross syndrome. Coined by Vladimir Janda, MD, DSc, lower cross syndrome refers to an imbalance and dysfunction of the agonists and antagonists that move and support the pelvis (Fig. 3). You may find the iliopsoas, rectus femoris, tensor fasciae latae, the lumbar erector spinae, and quadratus lumborum to be short and hypertonic, while the abdominals, gluteus maximus, and hamstrings are stretched and weak. The weakened muscles become less able to oppose the actions of the agonists that function in hip flexion and lumbar extension. As this happens, the imbalance can become more profound and the body less able to reverse the process without intervention (Table 1).

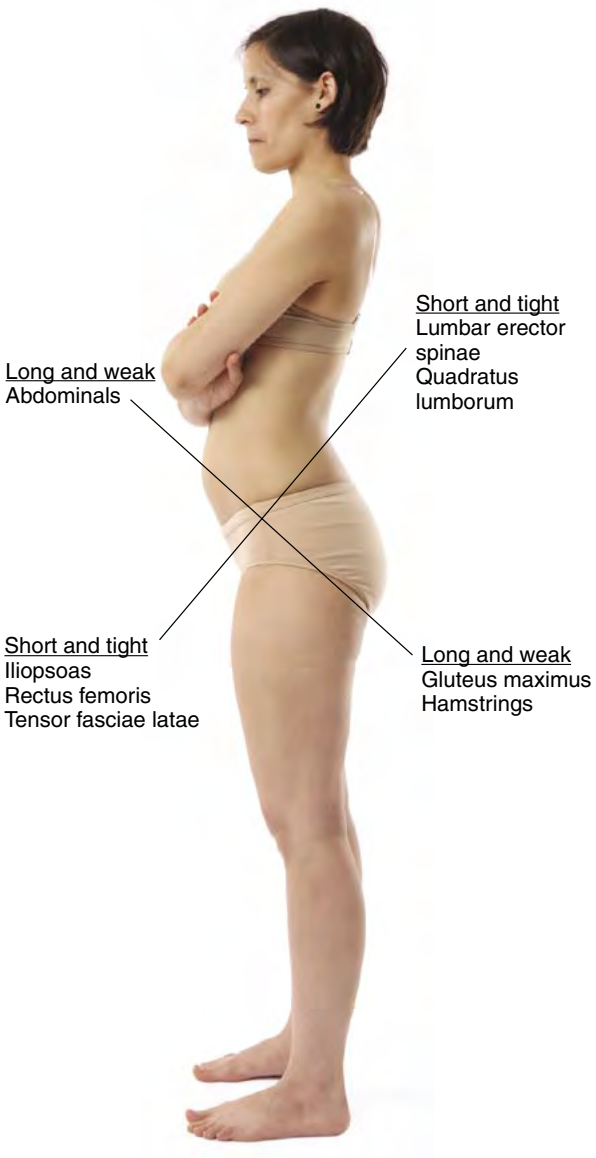


Figure 8-3 Muscles of the lower cross.

Table 8-1: Muscles of the Lower Cross with Actions That Contribute to Hyperlordosis

MUSCLES THAT ARE SHORT AND TIGHT (WITH AGONIST ACTION)	MUSCLES THAT ARE STRETCHED AND WEAK (WITH ANTAGONIST OPPOSITION)
Psoas (hip flexion, increased lumbar curve)	Gluteus maximus (hip flexion)
Iliacus (hip flexion, anterior pelvic tilt)	Hamstrings (hip flexion, anterior pelvic tilt)
Rectus femoris (hip flexion, anterior pelvic tilt)	
Tensor fasciae latae (hip flexion, anterior pelvic tilt)	
Latissimus dorsi (anterior pelvic tilt)	
Quadratus lumborum (lumbar spine extension)	Rectus abdominus (lumbar spine extension)
Lumbar erector spinae (lumbar spine extension)	External abdominal obliques (lumbar spine extension)
	Internal abdominal obliques (lumbar spine extension)

COMMON SIGNS AND SYMPTOMS

The most common symptom of developing lumbar hyperlordosis is low back pain. The short, hypertonic psoas pulls the lumbar vertebrae anteriorly, increasing the lumbar curve, while the short, tight iliacus tilts the pelvis anteriorly. This stress on the spine and pelvis can reduce the mobility of the vertebrae, sacroiliac joint, and hips. As the muscles of the lower cross shorten or lengthen around these postural deviations, they become less able to perform their actions fluidly. Shortened muscles may not lengthen fully, and weakened muscles may not be able to oppose the actions of the shortened muscles. For example, weak abdominals may not be strong enough to maintain an erect posture when seated or standing, leaving the posterior lumbar muscles to work harder. When standing, lengthened or weakened hamstrings have difficulty opposing the action of the rectus femoris and iliopsoas, which flex the hips and tilt the pelvis anteriorly. The combination of hypertonicity and weakness through the lower cross results in pain when the client needs to recruit these muscles to perform activities or maintain a stable, erect posture.

As the condition progresses, other patterns may develop. The hip adductors may become hypertonic as a result of the increased activity needed to maintain posture or oppose the lateral rotation of the hips. With lateral rotation of the hips, the piriformis shortens and may become hypertonic while the iliotibial band distorts and creates torsional force throughout the thigh. The sacroiliac joint may become hypomobile, and facet joints may become irritated, putting a client who frequently bends and stands at greater risk for a herniated lumbar disc. As the body adjusts to a new center of gravity, the arch of the foot may flatten as the weight of the body is shifted to the ball of the foot. Hip or leg pain may also be present, particularly if another condition such as piriformis syndrome, patellofemoral syndrome, or plantar fasciitis is present. If nerves become compressed by tight muscles or impinged between bones that have deviated from their natural alignment, numbness and tingling may also occur in the lower extremity. Compression of the vasculature or lymph nodes can lead to edema in the lower extremity.

The fascia across the anterior hip and the thoracolumbar fascia may be restricted. During palpation, you may find tenderness in the rectus femoris, particularly near the superior attachment, in the iliacus at the iliac fossa, and in the psoas deep in the abdomen. Tenderness may also be felt along the iliac crests, at the sacroiliac joint, over the sacrum, and around the greater trochanter. When extension of the lumbar spine contributes to hyperlordosis, the area between the lower ribs and iliac crests may be affected. The deep lateral rotators of the hips are likely to be tender if the hips are laterally rotated.

Whether a contributing factor to hyperlordosis or a result of it, compensatory hyperkyphosis may cause any or all of the pain patterns that are common in clients with an increased kyphotic curve, such as internally rotated shoulders and the head-forward posture.

POSSIBLE CAUSES AND CONTRIBUTING FACTORS

Low back pain may be a symptom of a more serious condition such as cancer, kidney stones, infection in the urinary system, endometriosis, spinal stenosis, or infection in the vertebrae. Refer to Table 2, and consult your pathology book to identify the client's signs and symptoms, and refer the client to a health care provider for medical assessment if you suspect a more serious condition.

Table 8-2: Differentiating Conditions Commonly Confused with or Contributing to Hyperlordosis

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Osteoporosis	Bone and joint pain, bone fractures, loss of height, slouching	Bone mineral density test CT X-ray Urinary calcium test	Massage is indicated in the early stages and with the approval of a health care provider in the later stages; may reduce pain. Take care not to use force that may fracture a bone.
Spondylolisthesis	Begins in the lumbar spine and may proceed to the thoracic spine Lumbar hyperlordosis Pain in low back, buttocks, and thighs Stiff back	X-ray Straight leg raise test	Massage is indicated. Stretching and strengthening are encouraged.
Ankylosing spondylitis	Pain often begins in the low back unilaterally and progresses bilaterally to the upper back and throughout the thorax Fatigue and anemia may develop	MRI Blood tests	Massage is indicated to reduce pain, maintain mobility, and slow progress of spinal distortion.
Achondroplasia	Dwarfism Low back pain Abnormal body proportions Bowed legs Decreased muscle tone Prominent forehead Short arms or legs Hyperkyphosis Hyperlordosis	Prenatal ultrasound and amniocentesis Genetic testing X-ray of long bones	Massage is indicated unless an underlying condition such as increased fluid in the brain or spinal stenosis is present.
Urinary and kidney pathologies	Back and flank pain Pain or burning during urination Frequent urge to urinate Fever Pressure in lower abdomen Cloudy, bloody, or foul smelling urine Nausea	Urinalysis or urine culture Ultrasound MRI	Massage is contraindicated until the condition is resolved. Avoid percussive strokes to the back of clients with a history of kidney stones.

Table 8-2: Differentiating Conditions Commonly Confused with or Contributing to Hyperlordosis (continued)

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Bone cancer	Pain, frequently in the long bones Weak bones easily fractured Swollen, tender joints Fatigue Fever Weight loss Anemia	X-ray CT scan Ultrasound MRI Bone scan Tissue biopsy	Massage may be supportive during treatment and recovery. Work with the health care provider to plan treatment that is best for the individual. A client with bone cancer is susceptible to fractures; take precautions to avoid this risk.
Prostate cancer	Urinary problems Blood in urine or semen Swelling in the legs Pelvic pain Bone pain or fractures Compression of the spine	Prostate-specific antigen test Digital rectal exam Ultrasound Biopsy	Massage may be supportive during treatment and recovery. Work with the health care provider to plan treatment that is best for the individual.
Cervical/uterine cancer	Unusual vaginal discharge or bleeding Pelvic/abdominal pain Abdominal mass Pain during intercourse	Pap test HPV exam Ultrasound Cervical/uterine exam Biopsy	Massage may be supportive during treatment and recovery. Work with the health care provider to plan treatment that is best for the individual.
Osteomyelitis	Unrelenting back pain Fever, chills, nausea Swelling and redness Stiffness or pain Weakness, numbness, and tingling in the extremities Drainage at the wound site	X-ray CT scan MRI Blood test Culture to determine bacterial or fungal infection	Massage is contraindicated until infection is resolved and the health care provider approves the massage.
Herniated lumbar disc	Muscle spasm Weakness or atrophy Low back pain Pain in buttocks, legs, and feet, which worsens when coughing, laughing, or straining Numbness and tingling in the legs and feet	Physical exam including muscle reflexes and strength Straight leg raise test X-ray CT MRI EMG Myelogram	Massage is indicated with caution. Work with the health care team.
Nerve root compression	Muscle spasm, weakness, or atrophy Pain radiates to the extremities	Kemp's test Valsalva maneuver Neurological exam to test reflexes, sensation, and strength	Massage is indicated if cause and location are understood. Take care not to increase compression or reproduce symptoms.

Pathologies that affect the integrity of bones often cause structural hyperlordosis. Porous bones (osteoporosis) become unable to bear weight and may cause the lumbar vertebrae, pelvis, and femur to collapse upon each other, resulting in increased curvature. Herniated discs in the lumbar spine not only cause low back pain but may also cause compensating structures to become stressed and the vertebrae to collapse upon each other, altering the curve of the spine. Scoliosis—a lateral curve in the spine—increases stress on the spine and the structures involved in moving the spine. Spondylolisthesis—a condition in which a vertebra slips forward relative to other vertebrae—may also cause hyperlordosis. This happens most often at L4-5 or L5-S1. Spondylolisthesis can be congenital or may develop from a degenerative disorder such as arthritis, from stress fractures, or from bone disease. Achondroplasia—a genetic disorder that slows the growth of bones—causes a variety of abnormalities affecting the length and shape of bones, particularly in the spine and extremities. Ankylosing spondylitis—an autoimmune disease that causes arthritis or swelling in the spine—may ultimately cause the bones to fuse, limiting the spine's mobility. Nutritional deficiencies of calcium and vitamin D as well as increased consumption of calcium oxalate and carbonated beverages may affect the body's ability to rebuild bone.

In some cases, contributing factors can lead to both structural and functional hyperkyphosis. In these cases, it is important to understand the level of stress to the bones before applying manual therapy to the muscles in order to avoid injury. Age may play a role in developing hyperlordosis because the bones become weaker and activity that keeps the joints mobile decreases with age. A sedentary lifestyle and lack of physical fitness reduce functionality and can lead to pain and dysfunction. Weight gain, particularly when it occurs in the span of a few months or a year, rapidly shifts the center of gravity and increases demands on the musculoskeletal system. The increased size and weight of the abdomen increases the load that the spine must support and may pull the lumbar spine anteriorly, increasing the lordotic curve. Pregnancy may contribute to this pattern, which often resolves itself after delivery. Previous injury or surgery around the low back, pelvis, legs, and abdomen may contribute to hyperlordosis. Injuries that were not properly treated to restore mobility and musculoskeletal function can initiate patterns of compensation that put stress on the muscles and bones. Surgery that produces scar tissue can affect the functionality of fascia and muscle by reducing contractile strength or the ability of those tissues to lengthen sufficiently.

The primary contributing factors in most cases of functional lumbar hyperlordosis, however, are poor posture and repeated activities of daily living. Prolonged standing and prolonged sitting as well as repeated resisted activities that involve bending, twisting, and lifting can cause dysfunction in the muscles of the lower cross and misalignment of the joints that they cross. For example, as mentioned above, when a client sits for long periods, the hip flexors may become shortened as the origins and insertions rest closer to each other while the erector spinae may fatigue from long-term, involuntary contraction in an attempt to keep the posture erect. This is particularly true when the client's abdominal muscles are too weak to contribute to maintaining proper posture. When the client stands, the shortened hip flexors keep the joint from fully extending, and this can leave the hips in varying degrees of flexion. The tight rectus femoris and iliacus pull on the pelvis, causing an anterior pelvic tilt. Without adjusting the posture of the spine, the client's eyes would be facing down. Because hip extension is restricted by the tight hip flexors, the lumbar spine extends without bringing the ilia and sacrum with it, which increases the lordotic curve, shortening the quadratus lumborum and the lumbar erectors.

Try it yourself: Slowly stand up from the seated position without fully extending your hips. Try to stand straight and look ahead. Feel your pelvis stabilized in an anterior tilt while your lumbar spine curves to compensate. You may also notice your knees locking into extension, and the adductors and the gluteal muscles contracting to maintain your center of gravity. When this becomes a common posture, the lumbar spine curves anteriorly. Moreover, when a client regularly holds this posture, the cervical spine must extend to allow the person to look forward, which can lead to hyperkyphosis if it is not already present.

When a person stands for long periods with weight on one leg, the hip on that side is often elevated, causing the sacrum to rotate and tilt. This may cause the sacroiliac joint to become less mobile. Postures that increase lateral rotation or adduction of the hip, as are common with dancers, may increase the risk of hyperlordosis. Wearing high heels displaces the center of gravity and encourages anterior pelvic tilt, increasing lordosis.

Table 2 lists conditions commonly confused with or contributing to hyperlordosis.

CONTRAINDICATIONS AND SPECIAL CONSIDERATIONS

- **Underlying pathologies.** Spondylolisthesis, osteoarthritis, osteoporosis, degenerative disc disease, bone spurs, or fusions may be present. If you suspect one of these (consult Table 2 and your pathology book for signs and symptoms), refer the client to a health care provider for medical assessment before initiating treatment. If the client is diagnosed with an underlying pathology that is not contraindicated for massage, work with the health care provider to develop a treatment plan that is appropriate for that individual.
- **Endangerment sites.** Be cautious near endangerment sites in the abdomen and femoral area. Gently palpate for the pulse of the abdominal aorta and the femoral artery before you begin working there. If you feel a pulse while working, back off slowly and reposition your stroke to avoid the endangerment site.
- **Menstruation.** Treating iliopsoas when a woman is premenstrual or menstruating may be uncomfortable. Offer to reschedule or to work all other structures, explaining that lengthening the iliopsoas is an integral part of treatment for hyperlordosis and may require followup after menstruation has ended. If you are unable to massage the iliopsoas, stretching the hip flexors by passively extending the hip is a good alternative.
- **Treatment duration and pressure.** If the client is elderly, has degenerative bone disease, or has a condition that diminishes activities of daily living, you may need to adjust your pressure as well as the treatment duration. Frequent half-hour sessions may suit the client better than prolonged treatment with long intervals.
- **Positioning.** Use bolsters to position a client for comfort as well as to reduce postures that may contribute to hyperlordosis. In the supine position, a bolster under the knees will keep the hip flexors from fully lengthening and may reduce lordosis and pressure on the lumbar spine. In the prone position, a bolster under the anterior superior iliac spines may reduce anterior pelvic tilt, and a bolster under the ankles may reduce stress on the low back.
- **Friction.** Do not use deep frictions if the client has a systemic inflammatory condition such as rheumatoid arthritis or osteoarthritis, if the health of the underlying tissues is compromised, or if the client is taking anti-inflammatory medication. Friction creates an inflammatory process, which may interfere with the intended action of anti-inflammatory medication. Recommend that your client refrain from taking such medication for several hours before treatment if their health care provider agrees.
- **Tissue length.** It is important when treating myofascial tissues that you do not lengthen those that are already stretched. Assess for myofascial restrictions first and treat only those that are clearly present. Likewise, overstretched muscles should not be stretched from origin to insertion. For example, because the abdominals and hamstrings tend to be overstretched, it is not advisable to perform myofascial release or a full stretch from origin to insertion on these muscle groups. If you treat trigger points in overstretched tissue, use heat or a localized pin and stretch technique instead of full ROM stretches.
- **Hypermobile joints and unstable ligaments.** Be cautious with mobilizations if the client has hypermobile joints or if ligaments are unstable due to injury, pregnancy or a systemic condition.

MASSAGE THERAPY RESEARCH

A thorough literature review found no research, case studies, or articles about the specific benefits of massage therapy for the treatment of hyperlordosis, lordosis, or lower cross syndrome. Much of the literature about the use of manual therapies to treat hyperlordosis comes from other disciplines, primarily physical therapy. Closer examination is needed on the benefits of massage therapy to lengthen shortened and hypertonic tissues along with self-care to strengthen lengthened, weak muscles.

Several articles, however, confirm the benefit of massage therapy for low back pain—the most common

symptom of hyperlordosis. In 2001, Hernandez-Reif et al. published a study titled "Lower Back Pain Is Reduced and Range of Motion Increased After Massage Therapy." In 2008, Jada Bell described a case study titled "Massage Therapy Helps to Increase Range of Motion, Decrease Pain and Assist in Healing a Client with Low Back Pain and Sciatica Symptoms." These studies are important because of the attention paid to hip flexion and to general areas or specific muscles known to contribute to hyperlordosis. Neither study mentions anterior pelvic tilt, and both also treated muscles that are not directly associated with hyperlordosis.

Hernandez-Reif et al. studied 24 participants who reported low back pain for at least 6 months prior, sought medical attention for the pain, and were cleared by their primary care providers to participate in the study. All participants were free of underlying conditions that can contribute to low back pain. The massage therapy group received 30-minute treatments twice per week for 10 weeks. The relaxation group (control group) was instructed to perform exercises for large muscle groups throughout the body. At the end of the study, the massage group reported less pain, less depression and anxiety, improved sleep, and improved ROM compared to the control group. Serotonin and dopamine levels, which are often depleted in patients with chronic pain, anxiety, and depression, increased in the massage group.

Bell's case study involved a 58-year-old client presenting with a 9-month history of low back pain that radiated into the lower extremity. MRI revealed spondylosis and a herniated disc that caused no nerve root impingement. The client occasionally used nonsteroidal anti-inflammatory medication, muscle relaxants, and narcotic analgesics and was receiving chiropractic care as well as physical therapy. The 45-minute treatments were administered once per week for 6 weeks following a 4-week period during which base line measures were recorded. During the treatment period, activities of daily living and ROM improved and pain was reduced. A significant limitation of this study was the use of physical therapy in addition to massage. Although the client's symptoms improved to a larger extent during the massage treatment period than the physical therapy period, it is impossible to determine whether massage alone or the combination of therapies produced these benefits.

In 2000, Michele Preyde published a study titled "Effectiveness of Massage Therapy for Subacute Low-back Pain: A Randomized Controlled Trial." The study tested 98 subjects between the ages of 18 and 81 with low back pain for 1–8 months prior to the study and no other significant pathology. The subjects were randomly assigned to one of four groups: comprehensive massage therapy (soft-tissue manipulation, remedial exercise, and posture education), soft-tissue manipulation only, remedial exercise with posture education only, or a placebo of sham laser treatment. Participants received six treatments over the course of approximately 1 month. Participants in the comprehensive group received 30–35 minutes of soft tissue manipulation and were taught stretching exercises for the trunk, hips, and thighs. Those in the soft tissue manipulation group received the same soft tissue manipulation as those in the comprehensive group but no remedial exercise, and those in the remedial exercise group performed the same exercises as those in the comprehensive group but received no soft tissue manipulation. Those in the control group received only sham infrared laser treatment. Intensity of pain, quality of pain, and function measures were recorded after each treatment, after 1 month of treatment, and again 1 month after treatment ended. The comprehensive group showed significant improvement in function, pain intensity, and pain quality compared to the other groups. The comprehensive and the soft tissue manipulation groups showed clinically significant improvement in function. At the 1 month follow-up, no pain was reported by 63% of the comprehensive group, 27% of the soft tissue manipulation group, 14% of the remedial exercise group, and 0% of the control group. The authors conclude that massage therapy is beneficial for clients with low back pain. The study does not describe which soft tissues were treated, stating only that "The exact soft tissue that the subject described as the source of pain was located and treated with the specific technique indicated for the specific condition of the soft tissue." Although hip flexion and extension were included in the remedial exercises, and these ROMs are relevant in assessing for hyperlordosis, further research is needed to determine the extent to which massage improves hyperlordosis specifically.

Several literature reviews also explore the benefits of massage for low back pain or compare the benefits of massage to other complementary and alternative therapies. In 2003, Cherkin et al. published a review titled "A Review of the Evidence for the Effectiveness, Safety, and Cost of Acupuncture, Massage Therapy, and Spinal Manipulation for Back Pain." They concluded that massage has been found to be effective for persistent back pain, that spinal manipulation has minimal clinical benefits, and that the effectiveness of acupuncture is unclear. In addition, the review concludes that only massage is cost effective. In 2008, Imamura et al. published a review titled "Evidence-Informed Management of Chronic Low Back Pain with Massage," which concludes that there is strong evidence suggesting massage has long-lasting benefits for nonspecific chronic low back pain and may be cost-effective by way of reducing visits to health care providers. The review also reports that further research into the specific mechanism of improvement with massage therapy is needed.

Working with the Client

CLIENT ASSESSMENT

Hyperlordosis is a common postural deviation causing chronic pain and restricted ROM in the low back and hips. It involves many joints and all of the muscles that cross them. A wide variety of possible factors can contribute to the development of hyperlordosis. All of these elements add up to many variations in how a client may present to you. For example, a client with increased lumbar curve and anterior pelvic tilt who often stands with more weight on one leg may present with lateral flexion of the thorax, an elevated iliac crest, sacroiliac joint immobility, and rotation in the hips or spine affecting the abdominal obliques, latissimus dorsi, multifidi and rotatores, and ligaments connecting the sacrum, pelvis, and spine. What follows are common presentations for hyperlordosis. However, it is essential to assess every joint to form an accurate picture for each individual client.

Assessment begins at your first contact with a client. In some cases, this may be on the telephone when an appointment is requested. Ask in advance if the client is seeking treatment for a specific area of pain so that you can prepare yourself.

Table 8-3: **Health History**

QUESTIONS FOR THE CLIENT	IMPORTANCE FOR THE TREATMENT PLAN
Where do you feel symptoms?	Location of symptoms gives clues to location of compression, trigger points, injuries, or other contributing factors.
Describe what your symptoms feel like.	Differentiate between the possible origins of symptoms and determine the involvement of muscles, joints, nerves, blood vessels, or viscera.
Do any movements make the symptoms worse or better?	Locate tension, weakness, or compression in structures producing such movements.
Have you seen a health care provider for this condition? What was the diagnosis? What tests were performed?	Bone density tests, blood tests, and other tests may indicate contributing factors.
Have you been diagnosed with a condition such as osteoporosis, rheumatoid arthritis, or osteoarthritis?	Systemic conditions may contribute to signs and symptoms, may require adjustments to treatment, and may impact treatment outcomes.
Have you had an injury or surgery, or did your symptoms begin during a pregnancy?	Injury or surgery and resulting scar tissue may cause adhesions, hyper- or hypotonicity, and atypical ROM. Changes in the center of gravity during pregnancy or other rapid weight gain may be a contributing factor.
What type of work, hobbies, or other regular activities do you do?	Repetitive motions and static postures that increase flexion of the hips or anterior pelvic tilt may contribute to the client's condition.

Table 8-3: **Health History (continued)**

QUESTIONS FOR THE CLIENT	IMPORTANCE FOR THE TREATMENT PLAN
Are you taking any prescribed medication or herbal or other supplements?	Medication of all types may contribute to symptoms or involve contraindications or cautions.
Have you had a cortisone shot in the past 2 weeks? Where?	Local massage is contraindicated.
Have you taken a pain reliever or muscle relaxant within the past 4 hours?	The client may not be able to judge your pressure.
Have you taken anti-inflammatory medication within the past 4 hours?	Deep friction initiates an inflammatory process and should not be performed if the client has recently taken anti-inflammatory medication.

Postural Assessment

Allow the client to enter the room ahead of you while you assess their posture and movements before they are aware that the assessment has begun. Look for imbalances or patterns of compensation for deviations common with hyperlordosis. Watch the client walk and look for reduced mobility in the hips or whether the client appears to be favoring one side. Have the client sit to fill out the assessment form, and watch to see if they lower into the chair cautiously or shifts around to find a comfortable position. Watch also as the client stands up to see if they are able to extend the hips fully and if standing from a seated position causes them to use the arms to lift themselves or to lean on a stable surface. When assessing the standing posture, be sure that the client is standing comfortably. If the client is asked to stand in the anatomic position, you will not get an

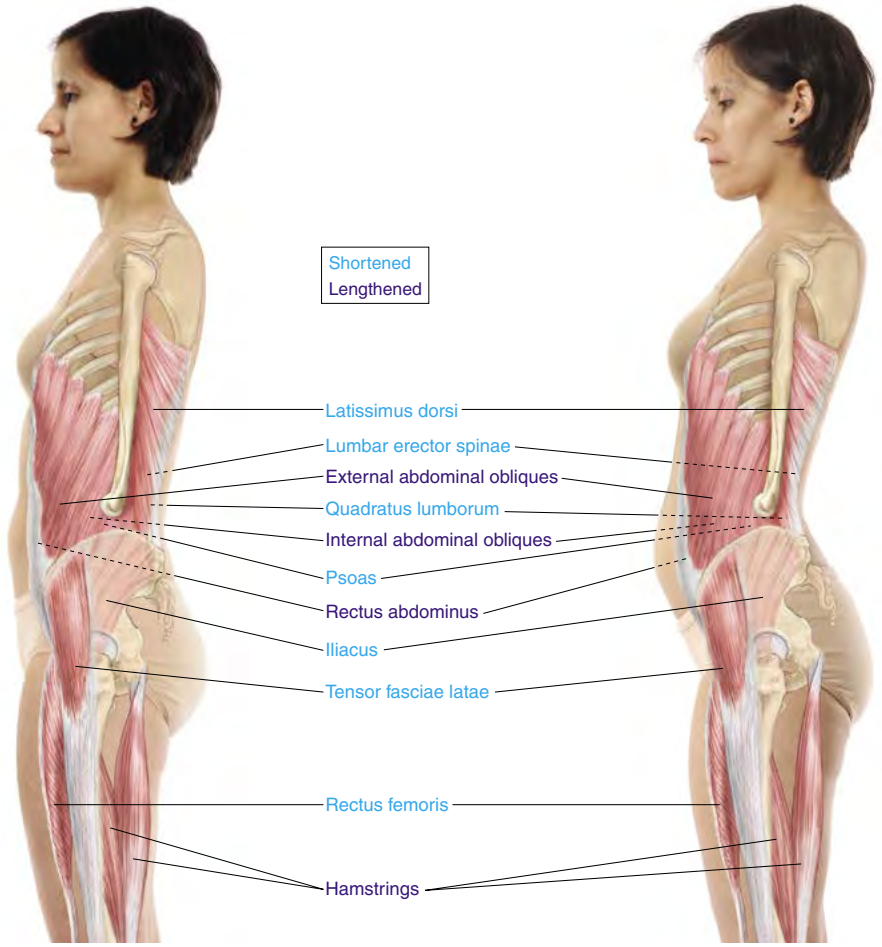


Figure 8-4 Postural assessment comparison.

accurate assessment of their posture in daily life. Look for anterior pelvic tilt, increased curve in the lumbar spine, hip flexion, rotation of the hips, hyperextended knees, and pronation or supination of the ankles.

Figure 4 compares healthy posture to a posture affected by hyperlordosis.

ROM Assessment

Test the ROM of the hips and lumbar spine as both agonists and antagonists. If hyperlordosis is structural in nature, do not perform ROM tests that move the affected joints into ranges that are inhibited by the altered joint structure or that may cause further damage. Since it allows the client to control the amount of movement and stay within a pain-free range, only active ROM should be used in the acute stage of an injury to prevent undue pain or re-injury.

Box 1 presents the average active ROM results for the joints involved in hyperlordosis.

Box 8-1: Average Active ROM for Joints Involved in Hyperlordosis

Trunk (at Lumbar Spine)

Flexion 50–60˚
- Rectus abdominis
- External oblique (bilateral)
- Internal oblique (bilateral)

Extension 25˚
- Spinalis (bilateral)
- Longissimus (bilateral)
- Iliocostalis (bilateral)
- Multifidi (bilateral)
- Rotatores (bilateral)
- Quadratus lumborum (bilateral)
- Latissimus dorsi (with arm fixed)

Lateral Flexion 25˚
- Spinalis (unilateral)
- Longissimus (unilateral)
- Iliocostalis (unilateral)
- External oblique (unilateral)
- Internal oblique (unilateral)
- Quadratus lumborum (unilateral)
- Latissimus dorsi (unilateral)

Ipsilateral Rotation 20˚
- Internal oblique (unilateral)

Contralateral Rotation 20˚
- External oblique (unilateral)
- Multifidi (unilateral)
- Rotatores (unilateral)

Pelvis

Anterior Tilt (downward rotation) (Angle from PSIS to ASIS) 0–10˚
- Rectus femoris
- Iliacus
- Sartorius
- Tensor fasciae latae

Posterior Tilt (upward rotation) (Angle from PSIS to ASIS) 0–10˚
- Biceps femoris
- Semitendinosus
- Semimembranosus

Lateral tilt (elevation) 0˚
- Latissimus dorsi (unilateral)
- Quadratus lumborum (unilateral)

Hip

Flexion 110–120˚
- Rectus femoris
- Tensor fasciae latae
- Sartorius
- Psoas major
- Iliacus
- Gluteus minimus
- Gluteus medius (anterior fibers)
- Adductor magnus (anterior fibers)
- Adductor longus
- Adductor brevis
- Pectineus
- Gracilis

Extension 10–15˚
- Gluteus maximus
- Biceps femoris
- Semitendinosus
- Semimembranosus
- Gluteus medius (posterior fibers)
- Gluteus minimus (posterior fibers)
- Adductor magnus (posterior fibers)

Lateral Rotation 40–60˚
- Gluteus maximus
- Gluteus medius (posterior fibers)
- Gluteus minimus (posterior fibers)
- Piriformis
- Quadratus femoris
- Obturator internus
- Obturator externus
- Gemellus superior
- Gemellus inferior
- Sartorius
- Biceps femoris (long head)
- Psoas major
- Iliacus

Medial Rotation 30–40˚
- Gluteus medius (anterior fibers)
- Gluteus minimus (anterior fibers)
- Semitendinosus
- Semimembranosus
- Tensor fasciae latae
- Gracilis

Hip (continued)

Abduction 30–50˚
- Gluteus medius
- Gluteus minimus
- Tensor fasciae latae
- Sartorius
- Gluteus maximus
- Piriformis (with flexed hip)

Adduction 30˚
- Adductor magnus
- Adductor longus
- Adductor brevis
- Pectineus
- Gracilis
- Gluteus maximus (low fibers)
- Psoas major
- Iliacus

Knee

Flexion 120–150˚
- Biceps femoris
- Semitendinosus
- Semimembranosus
- Gracilis
- Sartorius
- Gastrocnemius
- Popliteus
- Plantaris

Extension 0–15˚
- Rectus femoris
- Vastus lateralis
- Vastus medialis
- Vastus intermedius

Medial Rotation (When Flexed) 20–30˚
- Semitendinosus
- Semimembranosus
- Gracilis
- Sartorius
- Popliteus

Lateral Rotation (When Flexed) 30–40˚
- Biceps femoris

Active ROM

Compare your assessment of the client's active ROM to the values in Box 1. Pain and other symptoms may not be reproduced during active ROM assessment, because the client may limit movement to a symptom-free range.

- **Active posterior pelvic tilt**, particularly when the hip flexors are lengthened as when standing, may be restricted and cause pain.
- **Active extension of the hip** may be reduced when muscle tension, adhesions, and trigger points shorten hip flexors or weaken hip extensors. The client may resist full active extension of the hip if this produces symptoms during activities of daily living.
- **Active medial rotation** of the hip may be reduced or cause pain when shortened or hypertonic muscles hold the hip in lateral rotation.

Passive ROM

Compare the client's P ROM on one side to the other when applicable. Note and compare the end feel for each range.

- **Passive extension of the hips** may be restricted when the hip flexors are shortened or hypertonic.
- **Passive medial rotation of the hips** may be restricted when lateral rotators such as the iliopsoas are short and hypertonic, which could occur if lateral rotation of the hips becomes a compensating pattern.

Resisted ROM

Use resisted tests to assess the strength of the muscles that cross the joints involved. Compare the strength of the affected side to the unaffected side.

- **Resisted extension of the hip** may cause pain in the low back when the hip flexors are short and hypertonic and the hip extensors are weak. The client may rotate the pelvis to compensate.
- **Resisted flexion of the thorax** may be reduced when the abdominals are weak and stretched. This test is best performed with the hips and knees flexed to reduce the contraction of the hip flexors.

SPECIAL TESTS

The following special tests can help you to determine which muscles are contributing to pain and when a client should be evaluated by a medical professional using X-ray or other tools, which may reveal conditions that are contraindications for massage or require special considerations when planning treatment with massage.

The **Valsalva maneuver** may reveal a herniated disc, tumor, or other factor that increases pressure on the spinal cord. This test is used when the client complains of pain in a localized area along the spine, particularly when coughing or sneezing. A herniated disc does not contraindicate massage, but this test is not specific for the cause of increased pressure. For this reason, it is best to refer the client to a health care provider for further testing before performing the massage. To avoid even a temporary reduction in circulation, do not perform this test if the client has tested positive for vertebral artery insufficiency or has a cardiovascular disorder.

1. With the client seated and facing you, ask them to take a deep breath and then attempt to forcefully exhale against the closed throat (such as when forcing a bowel movement).
2. The test is positive if the client feels pain in a localized spot along the spine.

Kemp's test may reveal a disc lesion or irritation of the facet joint in the lumbar spine. Neither of these contraindicates massage, but it is best to understand the extent of damage and to be sure that these are not signs of something more serious before performing any deep tissue treatments.

Figure 8-5 Kemp's test..

Figure 8-6 Stork test.

1. With the client standing, ask them to slowly extend, laterally flex, and rotate the spine to the affected side as if reaching for the heel (Fig. 5). This action increases stress on the nerve root and facet joints.
2. The test is positive for nerve root irritation if the client feels radiating pain or numbness and tingling in the affected leg. Ask the client to describe the area of symptoms to help you determine which nerve root is affected.
3. The test is positive for facet joint irritation if pain is localized along the lumbar vertebrae. Very localized symptoms may help you to determine which vertebrae are affected.

The **Stork test** is intended to assess sacroiliac joint mobility.

1. The client should be standing near a stable surface or wall that they can lean on to maintain balance during the test.
2. Begin on the side you suspect is dysfunctional, and then compare the results of both sides.
3. Kneel or sit behind the standing client with one thumb on the posterior superior iliac spine of the affected side and the other thumb on the sacrum at the same level.
4. Instruct the client to flex the hip and knee on the affected side within their comfort range. Notice the relative movement of your thumbs while the client flexes the hip (Fig. 6).
5. When the sacroiliac joint is normally mobile, the ilium should rotate posteriorly, moving the thumb on the posterior superior iliac spine inferior. The test is positive for decreased sacroiliac joint mobility if the thumb on the posterior superior iliac spine moves superiorly while the client flexes the hip.

The **Thomas test** is intended to assess the client for shortened hip flexors. This test may not be comfortable for clients with severe low back pain.

1. Instruct the client to sit at the edge of the massage table so that the legs can hang freely, then assist the client to lie back.
2. Ask the client to flex one hip by bringing the knee toward the chest (Fig. 7). The unflexed hip is the one being tested. If you suspect that one side is primarily responsible for symptoms, instruct the client to flex the unaffected hip first.
3. If the hip flexors are shortened, the straight leg (the affected side) will come off the table, unable to extend fully because the hip flexors are unable to lengthen fully. If the rectus femoris is short and cannot lengthen fully, the knee of the affected leg will be slightly extended. These results indicate a positive test.
4. To assess the degree of the increased lumbar curve and anterior pelvic tilt caused by tight hip flexors, try to slip your hand under the lumbar curve. If your hand moves in easily, this is a sign that the extension the hips increases the lumbar curve and anterior pelvic tilt because the hip flexors cannot lengthen fully.

Figure 8-7 Thomas test.

of

5. Repeat the test on the unaffected side for comparison. Although the client may feel symptoms only on one side, these muscles may be short on both.

Palpation Assessment

Palpate the muscles of the lower cross to assess for hyper- and hypotonicity and myofascial restrictions. You are likely to find myofascial restrictions across the anterior aspect of the hip joint, from the iliac crest down into the quadriceps as well as along the posterior iliac crests and into the thoracolumbar fascia. Shortened, hypertonic muscles that may contain trigger points include the iliacus, psoas major, rectus femoris, sartorius, and tensor fasciae latae anteriorly; posteriorly, these muscles include latissimus dorsi, the lumbar erector spinae and quadratus lumborum. If the client presents with lateral rotation in the hips, assess the lateral rotators of the hips including the piriformis, quadratus femoris, obturator internus and externus, and the gemellus superior and inferior. While the superficial gluteals may be stretched in clients with hyperlordosis, the deeper gluteal muscles with varied functions may be tight and adhered. If the client presents with an elevated iliac crest or lateral flexion of the thorax or lumbar spine, assess the latissimus dorsi, internal and external obliques, serratus posterior inferior, and the thoracic erector spinae on the affected side. A compromised serratus posterior inferior can also affect respiration. Although the focus here is on the muscles that are directly related to the postural imbalance occurring in hyperlordosis, it is essential to assess the synergists and antagonists in each ROM for these joints. For example, although the rectus femoris is a hip flexor involved in hyperlordosis, it also extends the knee. In this example, you may find adhesions between the rectus femoris, vastus lateralis, and vastus intermedius. While the internal and external obliques both laterally flex the thorax to the same side, internal obliques rotate the thorax to the same side while external obliques rotate the thorax to the opposite side. When muscles are short or otherwise compromised, any of their actions may be compromised and any of the synergists and antagonists for each of their actions may be affected.

Overstretched muscles that may contain trigger points include the rectus abdominis, gluteus maximus (particularly the lower fibers), and the hamstrings. If lateral rotation of the hip is present, the adductor magnus, longus, and brevis as well as the gracilis, and pectineus may be overstretched and weak. However, if the adductors are regularly recruited to maintain posture or are overworking to antagonize lateral rotation, they may be hypertonic.

CONDITION SPECIFIC MASSAGE

Because hyperlordosis may have a structural cause, it is essential to understand the client's health history before initiating treatment. If a systemic condition or a degenerative bone or disc disease is present, discuss treatment with the client's health care provider and adjust the treatment accordingly. If hyperkyphosis, piriformis syndrome, patellofemoral syndrome, or plantar fasciitis is present, refer to those chapters for special testing and consideration of neuromuscular characteristics.

It is essential for the treatment to be relaxing. You are not likely to eradicate the pain associated with hyperlordosis or any of the associated conditions in one treatment. Do not try to do so by treating aggressively. Be sure to ask your client to let you know if the amount of pressure you are applying keeps them from relaxing fully. If the client responds by tensing muscles or has a facial expression that looks distressed, reduce your pressure. Remember that you are working on tissue that is compromised.

Ask the client to let you know if any part of your treatment reproduces symptoms, and always work within their tolerance. When deep palpation of a trigger point reproduces symptoms, explain this to your client and ask them to breathe deeply during the technique. As the trigger point is deactivated, the referral pain will also diminish. Common trigger points and their referral points are shown in Figure 8.

If any other symptoms are reproduced, adjust the client to a more neutral position, reduce your pressure, or move slightly off the area, and make a note about it because this may help you understand more clearly exactly which neuromuscular condition is contributing to the client's symptoms. Instruct your client to use deep but relaxed breathing to assist in relaxation.

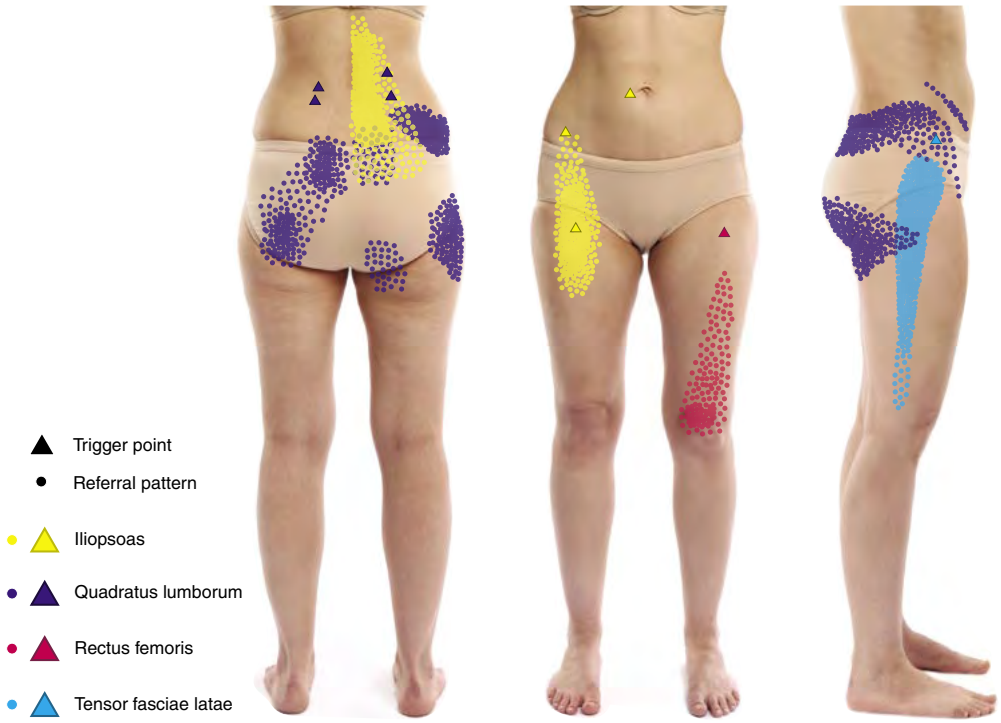


Figure 8-8 Common trigger points and referral. Common trigger points associated with hyperlordosis and their referral patterns.

The following suggestions are for treatment that considers several factors involved in hyperlordosis. Because several joints and many muscles are involved in this condition, your treatment will likely fill the entire session.

Treatment Goals:

 Increase circulation
 Reduce adhesions
 Reduce tone/ tension
 Lengthen tissue
 Treat trigger points
 Passive stretch
 Clear area

- Begin in the supine position with the knees bolstered.

- If you have access to moist heat, place it on one rectus femoris. After heating one rectus femoris, move the heat to the other side, and begin treating the heated side. After heating the other rectus femoris, you can move the heat to the abdomen.

- Before applying emollient, assess the tissues of the leg and hip for myofascial restrictions, and release them if indicated. A common area of myofascial restriction with hyperlordosis is found where the hip flexor tendons cross the hip joint. You may also find adhesions along the iliac crests. If the rectus femoris is shortened, you may find adhesions anywhere along its length, and it may be adhered to any of the muscles that surround it.

- Treat the thigh generally to soften tissues and reduce hypertonicity.

- Apply lengthening strokes along the rectus femoris and assess for trigger points. Note the varied fiber directions of the rectus femoris. Treat the trigger points if any are found. Common trigger points in the rectus femoris are found near the superior tendon and refer pain along the muscle into the knee.

- Treat the tensor fasciae latae for hypertonicity and trigger points if found. Because this area may be sensitive or ticklish, begin slowly with firm (not deep) strokes. Trigger points in the tensor fasciae latae refer pain along the iliotibial band.

- If your assessment revealed shortened or hypertonic adductors or iliotibial band, treat these. Assess and treat any trigger points found.

- Passively Stretch any muscles treated for trigger points.

- Before treating the iliopsoas, warm the abdominals to be certain that the superficial tissues are prepared to allow you to access the deeper tissues. When warming the abdomen, it is important to work in a clockwise direction to move the contents of the intestines toward the rectum. Your client may feel the need to pass gas during this treatment. Instruct them not to hold this back because that would cause muscle tensing.

- With fingers resting on the medial aspect of the iliac crest, instruct the client to take a deep breath into the abdomen, and as they exhale, gently move into the iliac fossa to treat the iliacus. The depth of your access into the iliac fossa will depend on the texture of the tissues surrounding it. If you cannot access the fossa, spend a little more time on softening the superficial tissues and try again. Trigger points in the iliacus refer pain into the quadriceps area and into the low back and gluteal muscles.

- Treating the psoas directly requires proficiency in the anatomy of the abdomen. There are many vessels and viscera that could be damaged when deep pressure is applied to the abdomen, and it is essential to know which structures you may be compressing as you approach the psoas. If you have not had detailed instruction on safely accessing the psoas or do not feel familiar enough

with abdominal anatomy to avoid vessels and organs, stretch the psoas by extending the hip when the client is prone.

- If you have had training in safely accessing the psoas, assess it, and treat it for hypertonicity and trigger points. One safe way to access the psoas is by placing your fingers at the level of the iliac crests and, very slowly, move medially toward the psoas. When you believe you have reached the psoas, ask the client to flex the hip and feel for a contraction.


- To ensure that the client has control over the amount of movement and pressure applied in the abdomen, ask them to slowly flex and extend the hip and feel the psoas move under your fingers. If the client reports nausea, pain, or other sensations that may suggest compression of a vessel or organ, discontinue treatment of the psoas, and give the client a minute to breathe and relax.

- Turn the client prone and bolster the ankles. Stretch the rectus femoris and iliopsoas by performing passive hip extension if this does not reproduce symptoms. If you notice the client's hip rotating or elevating during the stretch, stabilize the sacrum and ilium with the palm of your free hand while extending the hip. If hip extension causes pain beyond the client's tolerance, try to stretch the rectus femoris alone by flexing the knee. Apply postisometric relaxation techniques to the hip within the client's tolerance to encourage the lengthening of the hip flexors.

- Assess and treat any myofascial restrictions found in the thoracolumbar fascia before applying lotions to the back.

- Once you are ready to apply lotions, warm the full back. If the client has had symptoms in the upper back, treat these as thoroughly as time permits.


- Treat the latissimus dorsi and serratus posterior inferior for hypertonicity and trigger points.

- Assess and treat the muscles of the lumbar spine. The attachment sites at the iliac crests, transverse and spinous processes, and lower ribs may be tender. Warm and soften the tissues attached to these bones to release tension in these muscles.


- Treat the bellies of the lumbar erector spinae and the deeper quadratus lumborum for adhesions, hypertonicity and trigger points. Apply cross-fiber strokes to separate the fibers and open the area for deeper work. Treat trigger points if any are found. Follow this with lengthening strokes.


- Once the erector spinae have softened and allow access to deeper tissues, apply lengthening strokes to the quadratus lumborum. Note the variety of fiber directions in the quadratus lumborum. Common trigger points in the quadratus lumborum are found in the angle formed by the twelfth rib and the spine, as well as in the flank midway between the twelfth rib and the ilium. Take care not to apply excessive force to the floating 11th and 12th ribs.

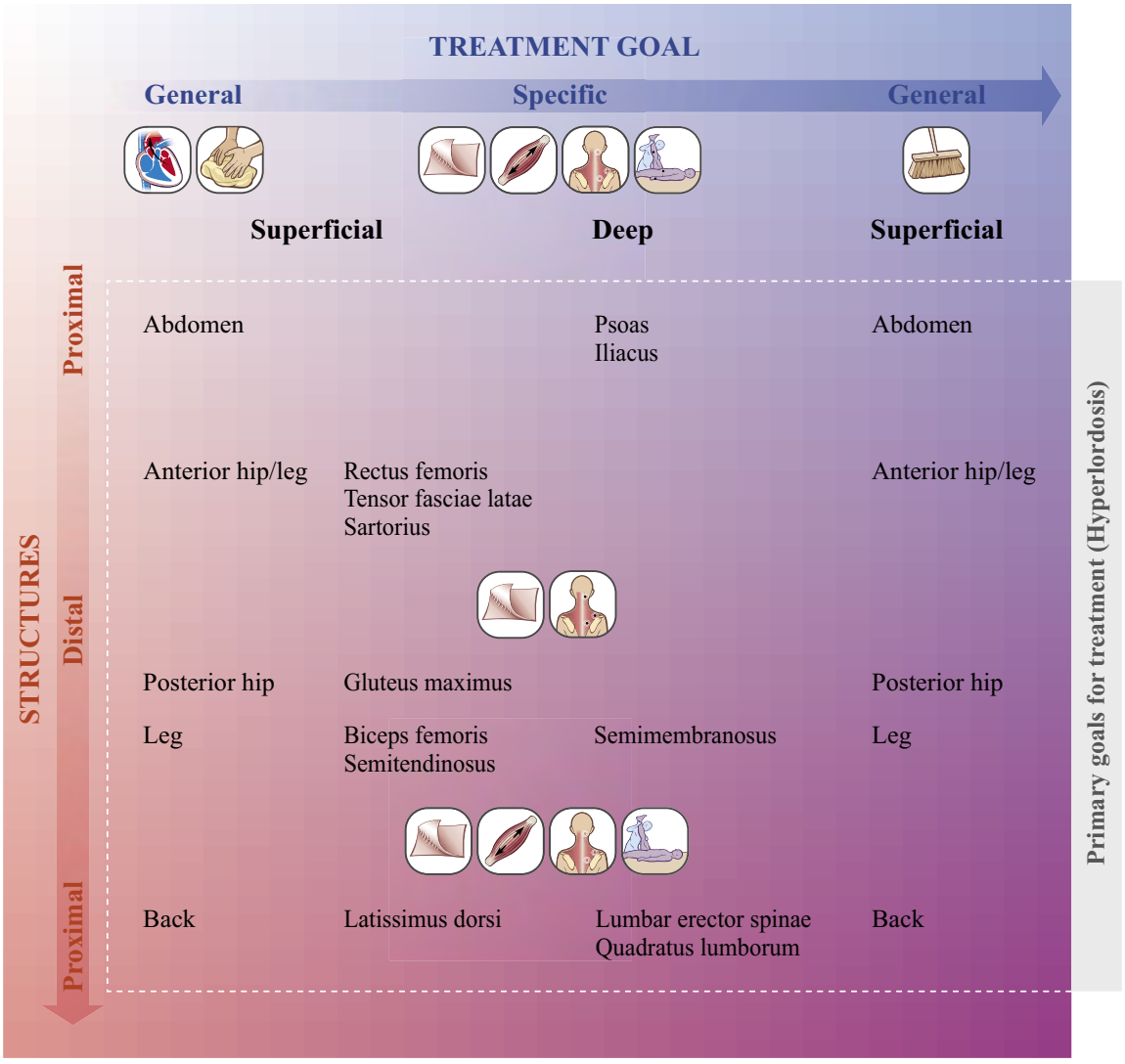

- Assess the hamstrings for adhesions and trigger points and treat if indicated. It is likely that the hamstrings are overstretched and should not be stretched further by using muscle stripping.


- From the prone position, ask the client to use their arms to slowly move the body without stressing the low back, bringing the buttocks toward the ankles, to stretch the quadratus

lumborum, erector spinae, and the latissimus dorsi (Fig. 9). When the client returns to the prone position, end with clearing strokes to the whole back.

Figure 8-9 Stretch quadratus lumborum and the lumbar erector spinae.

- With the remaining time, consider the other possible conditions that may develop with hyperlordosis and treat these areas. External or internal rotation of the hip suggests treatment to the piriformis and other external rotators or the adductors, respectively. Flat feet suggest treatment to the muscles of the lower leg and feet. If hyperkyphosis is also present, refer to the hyperkyphosis chapter for additional treatment. You may not have time to treat all of these fully, but you can pay attention to some of them in each session. As the signs and symptoms of hyperlordosis decrease, you can increase the amount of time you spend in other areas.



CLIENT SELF-CARE

The following are intended as general recommendations for stretching and strengthening muscles involved in the client's condition. The objective is to create distance between the attachment sites of muscles that have shortened and to perform repetitions of movements that decrease the distance between the attachments of muscles that have weakened. If you have had no training in remedial exercises or do not feel that you have a functional understanding of stretching and strengthening, refer the client to a professional with training in this area.

Clients often neglect self-care because their daily lives are busy. Encourage them to follow these guidelines.

- Instruct the client to perform self-care throughout the day, such as while taking a phone call, reading e-mail, washing the dishes, or watching television, instead of setting aside extra time. When performing activities while standing, contracting the abdominal muscles or "sucking in the stomach" as well as tilting the pelvis posteriorly by squeezing the gluteal muscles may decrease pain and weakness in addition to toning these weakened muscles. This should be done only if it is comfortable and if it does not cause the client to breathe shallowly.
- Encourage the client to take regular breaks from repetitive actions.
- Demonstrate gentle self-massage to keep adhesions and hypertonicity at bay between treatments.
- Recommend that the client avoid sleeping with the hips flexed.
- Instruct the client on how to maintain proper posture in the standing and seated positions to keep pressure off the weakened joints. Sitting in a chair that supports the back and allows the client to rest the feet flat on the floor with the knees and hips flexed at approximately 90° may reduce muscle strain and stress on the joints.
- Instruct those whose exercise is focused on strengthening the quadriceps to stretch these and to strengthen the hamstrings by performing extensions of the hip, resisted or not, depending on their capability. Walking is a low-impact activity that helps keep the joints mobile.
- Instruct a client who regularly performs heavy lifting to bend the knees, and lift with the legs instead of the spine.
- Demonstrate all strengthening exercises and stretches and have the client perform these in your presence before leaving to ensure that they are performing them properly and will not harm himself or herself when practicing alone. Stretches should be held for 15–30 seconds and are performed frequently throughout the day, within the client's limits, during an active flare-up. The client should not force the stretch or bounce. Exercises should be slow, gentle, and steady while the client tries to keep every other muscle as relaxed as possible.

Figure 8-10 Hip flexor stretch.

Stretching

Instruct the client to stretch their hip flexors by kneeling with one knee on a soft surface such as a pillow on the floor and the other foot on the floor with the hip and knee flexed (Fig. 10). The client should then

Figure 8-11 Lumbar stretch.

slowly move the pelvis forward with the spine erect, lengthening the quadriceps and iliopsoas on the side of the unflexed hip. Switch legs to stretch the other side.

It is also important to reduce anterior pelvic tilt. While this may occur when lengthening the hip flexors, for some, it will be necessary to add a little push. Instruct the client, particularly when standing, to squeeze the gluteal muscles together toward the midline. This action will tilt the pelvis posteriorly while strengthening the gluteals.

To lengthen the lumbar erectors and quadratus lumborum, simple forward bends performed periodically throughout the day are helpful. To add an additional stretch with the pelvis stabilized and hip flexion minimized, instruct the client to stand approximately 12 inches from a wall with the dorsal surface of the hands along the edges of the sacrum as shown in Figure 11 A&B. With the hands on the sacrum, instruct the client to lean their back against a wall with the knees slightly bent. The hands help stabilize the sacrum and pelvis while the client extends the knees and slowly bends forward at the hips, stretching the low back.

Strengthening

While it may be important to strengthen the abdominal muscles for core strength, it is essential that these exercises do not include resisted flexion of the hips. Crunches are best performed with the knees bent to inhibit the hip flexors. While performing crunches this way, the client need not flex the thorax completely, since this might place strain on the low back. Small crunches held for 3–5 seconds will strengthen the abdominal muscles without undue stress on the lumbar spine.

Extension of the hip strengthens the hamstrings and gluteal muscles. The hamstrings are also strengthened by flexing the knee. These exercises can be performed while standing and leaning against a wall or other stable surface for balance or while positioned on the hands and knees (Fig. 12). An elastic band around the ankles can be used to add resistance within the client's tolerance.

Figure 8-12 Strengthen hamstrings and gluteal muscles.

Suggestions For Further Treatment

Ideally, a client with hyperlordosis will have treatments twice a week until the client can perform activities of daily living with minimal or no pain for at least 4 days. Reduce frequency to once per week until symptoms are absent for at least 7 days. When the client reports that they have been pain-free for more than 7 days, treatment can be reduced to twice per month. If the client is pain-free for 2 or more consecutive weeks, they can then schedule once per month or as necessary. With structural hyperkyphosis, treatment goals are limited to pain relief and minor increases in ROM, and these may be temporary. With functional hyperlordosis, there should be some improvement in both pain and posture with each session. If this is not happening, consider the following possibilities:

- There is too much time between treatments. It is always best to give the newly treated tissues 24–48 hours to adapt, but if too much time passes between treatments in the beginning, the client's activities of daily living may reverse any progress.
- The client is not adjusting their activities of daily living or is not keeping up with self-care. As much as we want to fix the problem, we cannot force a client to make the adjustments we suggest. Explain the importance of the client's participation in the healing process and encourage them to follow your recommendations, but be careful not to judge or reprimand a client who does not.
- The condition is advanced or involves other musculoskeletal complications that are beyond your basic training. Refer this client to a massage therapist with advanced clinical massage training. Continuing to treat a client whose case is beyond your training could turn the client away from massage therapy altogether and hinder healing.
- The hyperlordosis is structural or there is an undiagnosed underlying condition. Discontinue treatment until the client sees a health care provider for a medical assessment, and work with the health care team to plan massage treatments.

If you are not treating the client in a clinical setting or private practice, you may not be able to take this client through the full program of healing. Still, if you can bring some relief in just one treatment, it may encourage the client to discuss this change with their health care provider and seek manual therapy rather than more

aggressive treatment options. If the client returns for regular treatments, the symptoms are likely to change each time, so it is important to perform an assessment before each session. Once you have released superficial tissues in general areas, you may be able to focus more of your treatment on a specific area. Likewise, once you have treated the structures specific to hyperlordosis, you may be able to pay closer attention to compensating structures and coexisting conditions.

Professional Growth

Case Study

Tangelique is a 38-year-old married mother of two children. She cares for her children during the day, which includes home-schooling, and works evenings in a high-end department store, giving perfume samples to customers. In the past year, she has made the consumption of locally grown, whole foods a priority in her home after her husband received a diagnosis of diabetes. Prior to this, processed food and carbonated drinks had been common in their diet. She has had minor low back pain for years, but recently the pain has intensified, and she feels weak when standing for long periods.

SUBJECTIVE

The client complained of low back pain and weakness when standing for more than 30 minutes. She has had minor back pain since her first pregnancy, and 2 weeks ago, she felt a sharp but diffuse pain across her low back when standing up from sitting. Since then she has had more severe back pain, sometimes causing her to hunch, and she feels weak after standing. She spends 4–6 hours each day home-schooling her children and 4 hours on 3 nights each week in a department store. When home-schooling, Tangelique is often seated for several hours at a time. At the department store, she stands the whole time and is required to wear contemporary fashions with high-heeled shoes.

The client reported no systemic conditions and is taking no medication currently. She reported having no abdominal pain or difficulty urinating or with bowel movements. When asked if she feels any numbness or tingling or has experienced any swelling in her legs, Tangelique stated only that on occasion she feels "electricity" on the front of her right leg. When asked if she wears hip huggers or tight belts low on the waist, she responded "Yes." The client is not currently pregnant, premenstrual, or menstruating.

OBJECTIVE

Postural assessment revealed a significant increase in the lumbar curve with anterior pelvic tilt. She displayed a minor lateral rotation of hips bilaterally. Valsalva and Kemp's tests were negative for space-occupying lesions and disc involvement. The Stork test was negative for sacroiliac joint dysfunction. The Thomas test was positive for short hip flexors. Tinel's sign was positive for irritation of the femoral nerve. This may be due to compression by tight clothing around the hips.

Palpation revealed fascial restrictions across the hip joint bilaterally and into the quadriceps area on the right thigh. The thoracolumbar fascia is thickened and adhered. The rectus femoris is dense and adhered bilaterally, but particularly on the right. The right tensor fasciae latae and iliotibial band are tender and adhered. The client was ticklish near the iliac fossa initially but was able to relax enough to reveal hypertonicity in the iliacus. Moderate pressure to the psoas caused pain in the low back. The latissimus dorsi contained adhesions at the lateral ribcage bilaterally. The quadratus lumborum and the lumbar erector spinae are tender, hypertonic, and adhered.

ACTION

I began in the supine position with a bolster under the knees. I applied myofascial release to tissues across the anterior hip joint and leg, taking care not to compress the femoral nerve. I applied general effleurage and petrissage to the anterior leg followed by muscle stripping to the rectus femoris, vastus lateralis, tensor fasciae latae, and the iliotibial band. There was a trigger point in the superior aspect of rectus femoris that referred down into the anterior leg. The client stated that this referral was similar to the area where she occasionally felt "electricity." Muscle stripping did not reduce the referred pain. I followed two rounds of compression with effleurage, which reduced the referred pain from level 6 to 2. I then applied clearing strokes to the legs and the hips.

I applied slow but firm petrissage around the anterior iliac crest to reduce tickling followed by deep petrissage in the iliac fossa. The area was very tender to the client at first, but the tenderness reduced quickly as each layer of tissue was released. No trigger points were found in the iliacus, and there was no reproduction of symptoms. I applied superficial, clockwise effleurage to the abdomen to warm the tissues. The psoas was hypertonic bilaterally, particularly on the right. I applied muscle stripping to the psoas in 1-inch increments. A trigger point was found in the mid belly of the right psoas, which referred into the back. Compression reduced the referred pain from level 8 to 6. I cleared the area, and then instructed the client to turn to the prone position, using the arms as much as possible to reduce the possibility of straining the low back.

I applied a passive stretch to the hip flexors bilaterally. I used myofascial release including skin rolling across the thoracolumbar fascia. I applied petrissage to the muscle attachment sites along the iliac crests, sacrum, and lower ribs. I also applied petrissage and firm effleurage to the latissimus dorsi bilaterally. No trigger points were found here. I used deep effleurage followed by muscle stripping to the lumbar erector spinae and quadratus lumborum. A trigger point was found in the mid muscle belly of the lateral portion of the right quadratus lumborum. Compression followed by muscle stripping reduced the referred pain from level 8 to 4. I cleared the area. I followed deep petrissage to the lateral rotators of the hip with a passive stretch.

Following treatment, the client reported feeling "looser" but stated that getting off the table did cause some discomfort in her low back.

PLAN

I explained that the shortened hip flexors pull on the spine and pelvis when she stands because they are unable to lengthen fully. I demonstrated the stretches for the hip flexors and the lumbar spine. I demonstrated strengthening for hamstrings and abdominals but encouraged her to wait for 24–48 hours to see how she responded to treatment before stressing the low back with abdominal strengthening exercises. I advised her to proceed cautiously, with the hips and knees flexed, if she chose to do the strengthening exercises.

I explained that tight clothing around her ilia may be compressing the femoral artery, causing the "electricity" she feels. I suggested that she wear looser clothing or bands and belts that do not rest on the pelvis. I also explained that high heels may be contributing to the postural imbalance, although I understand that this is part of her uniform, and she may not be able to stop wearing them. I recommended wearing lower heels as much as possible and to practice posterior pelvic tilt and calf stretches after wearing high heels.

The client is unable to schedule treatments biweekly, but she scheduled one appointment for next week and stated that frequency will depend on financial restrictions. A sliding scale was offered if she felt she needed more frequent treatments, and I encouraged her to call if she had questions about more intensive self-care if she is unable to return regularly for treatment.

CRITICAL THINKING EXERCISES

1. Develop a 10-minute stretching and strengthening routine for a client that covers all of the muscles involved in hyperlordosis. Use Table 8-1, Box 8-1, and Figure 8-4 as a guide. Remember that a stretch increases the distance between the origin and insertion of a muscle and is important for those muscles that are shortened while strengthening is performed by actively bringing the origin and insertion closer together and is important for the antagonists of shortened muscles. Describe each step of the routine in enough detail that the client can refer to these descriptions in your absence and perform them without harm.
2. A client calls to schedule a massage for low back pain. She explains that she had a caesarian section 7 years ago that left a scar above her pelvis. Discuss the role her surgery may have had in the development of her chronic pain, the essential questions to ask her and her health care provider before initiating treatment, and the cautions and considerations to take when planning treatment.
3. In the assessment of a client with chronic low back pain, he tests negative for short hip flexors and has no anterior pelvic tilt. The client has a right rotation of the pelvis, his left hip is elevated, his thorax is flexed to the left, his right hip is laterally rotated, and his left ankle is everted. His left hamstrings are hypertonic compared to his right. Use Table 8-1 to determine which muscles are short and which may be lengthened. Put yourself in this posture to figure out how this client's activities or posture may be contributing to his pain. Design a treatment plan describing massage therapy as well as self-care.
4. Conduct a short literature review to learn how the following conditions may put a client at greater risk for developing hyperlordosis:
    - Nerve root compression
    - Obesity
    - Rheumatoid arthritis
    - Vitamin D deficiency
    - Spondylolisthesis

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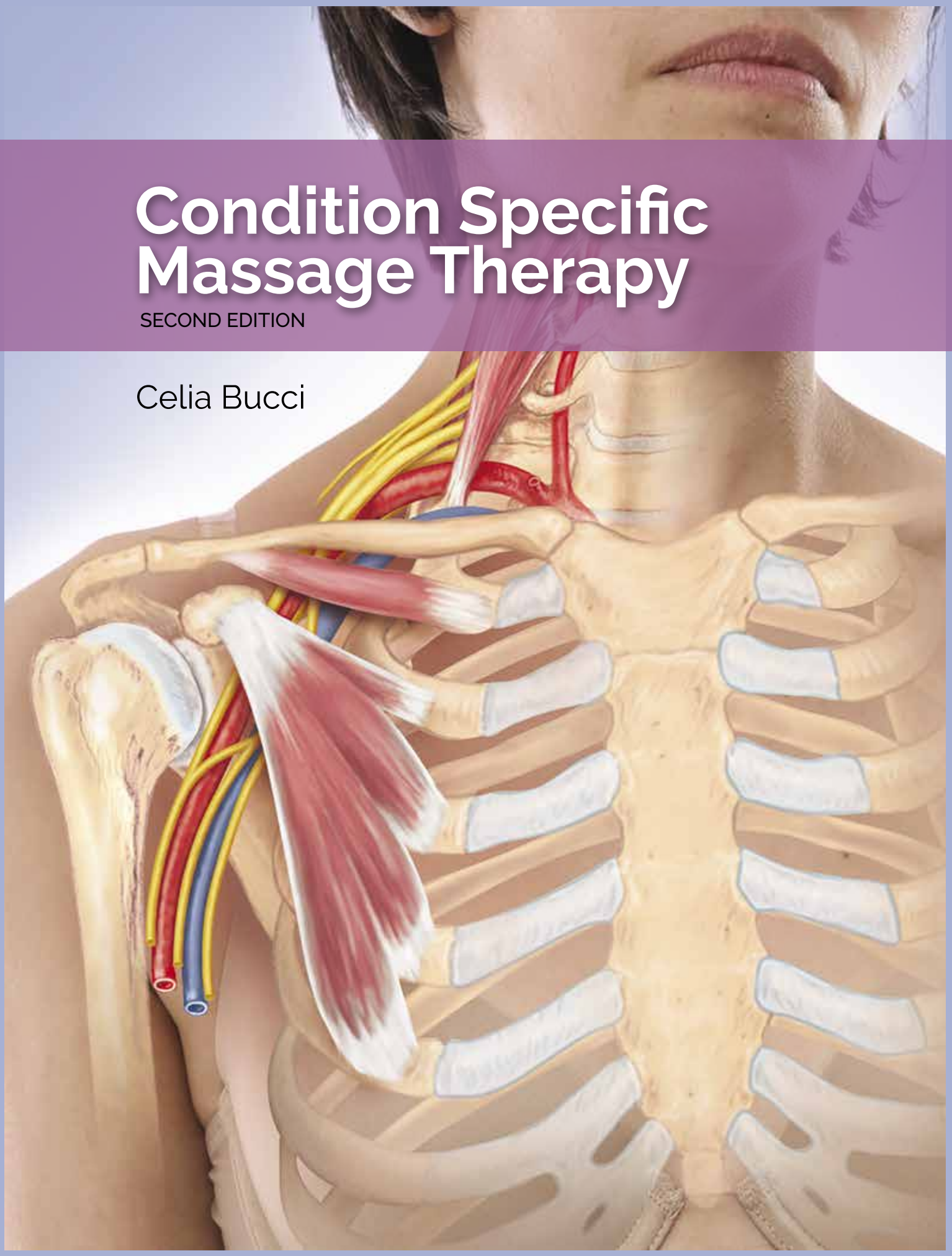
Condition Specific Massage Therapy

SECOND EDITION

Celia Bucci



Chapter 9:

Piriformis Syndrome

Piriformis Syndrome

Understanding Piriformis Syndrome

Piriformis syndrome is a complex condition characterized primarily by myofascial pain with trigger points, which may involve nerve and vascular compression or sacroiliac joint dysfunction. Often, piriformis syndrome is reported as "sciatica," a general term referring to pain along the sciatic nerve, which can result from a variety of causes other than piriformis syndrome including a herniated disc, impingement of the nerve between bones, degenerative disc disease, spinal stenosis, tumors compressing the nerve, and trauma.

Because the piriformis muscle fits precisely in the greater sciatic foramen, increased tone and trigger points that shorten and increase the width of the muscle decreases the space available for the nerves that also pass through the foramen to function optimally. Normally, the sciatic nerve emerges from the sacrum and passes deep to the piriformis muscle. In a small percentage of the population, the sciatic nerve travels through the piriformis or the piriformis muscle is split into two bellies with the sciatic nerve running between them. Although the sciatic nerve is most often affected by piriformis syndrome, the gluteal and pudendal nerves may also become irritated. Compression can also affect the vasculature, reducing circulation and affecting the health of the structures supplied by those vessels.

The sciatic nerve exits the spine as five separate roots between L4 and S3. They converge into one large sciatic nerve at the greater sciatic foramen under the piriformis muscle. From here, the nerve curves toward the hip and passes between the greater trochanter and the ischial tuberosity, then down the middle of the thigh along the length of the femur (Fig. 1). The sciatic nerve innervates the skin of the leg and foot, as well as the hamstrings. Just above the knee, the nerve divides into the common peroneal and tibial branches. Generally, these branches innervate the muscles of the anterior and lateral leg and the top of the foot and the posterior leg and the bottom of the foot, respectively.

Muscles innervated by the sciatic nerve and its branches include the following:

- Adductor magnus, posterior head (sciatic nerve)
- Semitendinosus (sciatic nerve)
- Semimembranosus (sciatic nerve)
- Biceps femoris (sciatic nerve)
- Plantaris (tibial nerve)
- Gastrocnemius (tibial nerve)
- Soleus (tibial nerve)
- Tibialis posterior (tibial nerve)

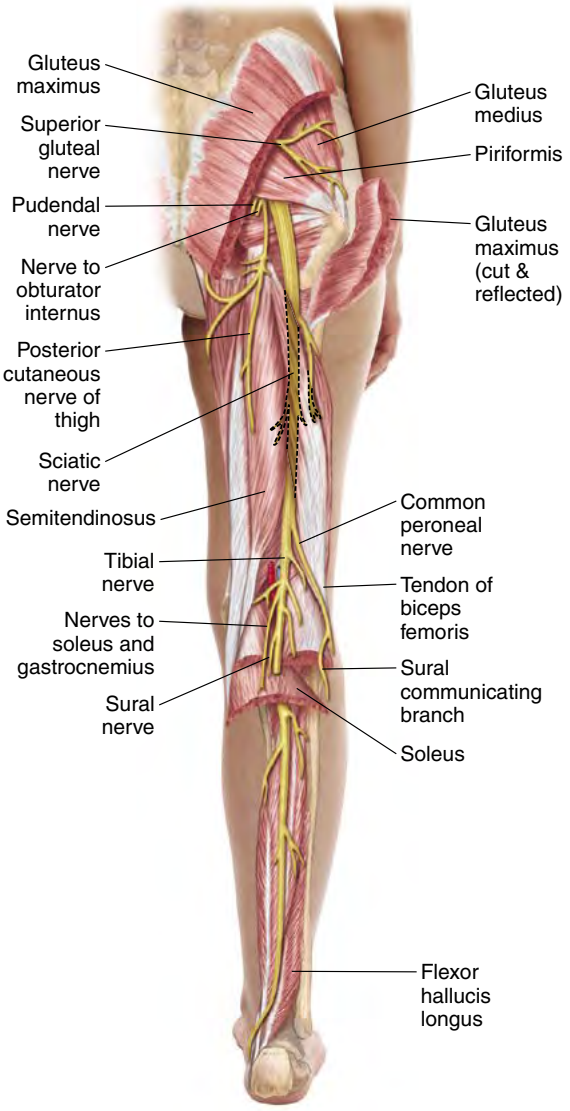


Figure 9-1 The sciatic nerve and its branches. The sciatic nerve passes under the piriformis muscle.

- Flexor digitorum longus (tibial nerve)
- Flexor hallucis longus (tibial nerve)
- Peroneus longus (superficial peroneal nerve)
- Peroneus brevis (superficial peroneal nerve)
- Tibialis anterior (deep peroneal nerve)
- Extensor digitorum longus (deep peroneal nerve)
- Extensor hallucis longus (deep peroneal nerve)
- Extensor digitorum brevis (deep peroneal nerve)
- Intrinsic muscles of the foot (medial and lateral plantar nerves)

COMMON SIGNS AND SYMPTOMS

The symptoms of piriformis syndrome usually begin gradually with pain in the low back, hip, or gluteal area. When the sciatic nerve is involved, radiating pain, numbness, or tingling is felt along the posterior thigh, calf, and foot. Active lateral rotation of the hip, which contracts the piriformis, and active or passive medial rotation of the hip, which stretches the shortened piriformis, may compress the sciatic nerve and intensify symptoms. An absence of numbness and tingling may suggest that the nerves are not involved; this is referred to as non-neurogenic piriformis syndrome. In these cases, referred pain from trigger points as well as weakness due to compensation may present similarly, and the condition can progress to involve the nerves and vessels if the syndrome is not treated.

Trigger points in the piriformis refer pain into the low back, buttocks, hip, and superior posterior thigh. When one piriformis is short, the sacrum may shift laterally toward the affected side and rotate anteriorly, causing sacroiliac joint dysfunction and pain in the low back. In this case, the ilium may be elevated on the opposite side. Sciatic nerve compression may cause pain in the posterior thigh with pain, numbness, and tingling radiating into the leg and foot and impaired proprioception causing an irregular gait and balance. Gluteal nerve irritation may cause pain in the buttocks and atrophy of the gluteal muscles. Pudendal nerve irritation can cause groin and perineal pain, bowel or bladder dysfunction, sexual dysfunction, and impotence. Irritation to the pudendal nerve has also been associated with prostatitis in men.

Sitting, walking, and climbing stairs often worsens the pain. Sitting, particularly with the affected hip flexed and adducted, such as with the legs crossed, often increases pain. Any posture or activity that opposes abduction or lateral rotation, the actions of the piriformis, stretches the muscle and may increase symptoms. If the condition has become chronic or is combined with hyperlordosis, it may be difficult for the person to find a comfortable position when sitting or lying down. Lateral rotation of the hip may relieve symptoms, but maintaining this posture encourages the deviation by keeping the piriformis short and weakening the medial rotators of the hip, decreasing their ability to oppose lateral rotation. Anomalies in posture associated with changes in the piriformis muscle may also decrease mobility in the sacroiliac joint and lead to changes in the muscles that attach to the sacrum and ilium, namely the latissimus dorsi, the lumbar erector spinae, and quadratus lumborum.

The further the syndrome progresses, the greater is the chance that the nerves will become damaged, causing changes in the tone and strength of the muscles innervated by them. In chronic cases, the client may develop an unsteady gait and postural instability due to impaired proprioception and weakening of the muscles from the gluteal region down to the foot. One presentation of this impairment is drop foot or difficulty in dorsiflexing the ankle, which causes the foot to drag or strike hard onto the ground when walking. Chronic compression may also contribute to edema in the lower leg and pallor, cooling, or dryness in the skin of the buttocks and leg. Therefore, it is important for a person suffering from even mild symptoms of piriformis syndrome to be treated as soon as possible.

POSSIBLE CAUSES AND CONTRIBUTING FACTORS

The piriformis muscle is the biggest of the six lateral rotators of the hip. It originates on the anterior surface of the sacrum and inserts on the superior aspect of the greater trochanter. The piriformis laterally rotates the hip and abducts the flexed hip. The sciatic nerve becomes compressed when the piriformis is shortened; it can also become hypertonic and develop trigger points. The other lateral rotators, namely the quadratus femoris, obturator internus and externus, and the gemellus superior and inferior, are likely involved in the postural deviation and should also be treated.

Standing with one hip laterally rotated with the weight on one leg or squatting with the knees separated also shortens the lateral rotators (Fig. 2). Sitting with the knees widely separated—a common posture for pregnant women or clients with a large abdomen—abducts and laterally rotates the hip, and passively shortens the muscles that perform this action. Adding weight or resistance to any of these activities increases the risk of spasm and trigger points in the piriformis.

The piriformis is overactive when the client's posture involves medial rotation of the hips, valgus of the knees, and eversion of the ankle, a posture often referred to as "knock-kneed" (Fig. 3). In this posture, the lateral rotators are overstretched and overworked as antagonists to the medial rotation of the hips, particularly when walking, running, or climbing stairs. When hyperlordosis coexists with piriformis syndrome, muscles attached to the ilium, sacrum, and femur work harder to stabilize the joints, which may increase tension. Any increase in the tone of the gluteal muscles may increase the possibility of the sciatic nerve becoming compressed between the piriformis and the pelvis. Postural deviations and the signs and symptoms of plantar fasciitis may also be found in clients with symptoms of piriformis syndrome when these deviations involve rotation of the hips. With each of the postural deviations and activities described above, adhesions and trigger points may develop, reducing the ROM of the hip and sacroiliac joints.

Figure 9-2 Standing with one or both hips laterally rotated.

Try these positions yourself. Begin by standing in the anatomic position. Now, laterally rotate one or both hips. Notice changes in the pressure on your pelvis, hips, knees, and ankles. Walk forward, and notice which muscles are compensating. When you stop walking, with the hips still laterally rotated, stand with your weight on one leg and notice how your pelvis, sacrum, and hips feel. With the hips still laterally rotated, sit down. Notice how your spine and pelvis compensate for this posture. If you draw your knees closer together, can you feel a stretch in the piriformis?

Now, stand and medially rotate your hips. Notice the change in distance between your knees, the angle of your femur, and the eversion in your ankle. Did you increase flexion in your knees to keep from straining the joint? While maintaining these deviations, walk forward. Feel the stress on your gluteal muscles and lateral rotators, the relative restriction in the ROM in your hips, and the stress on your knee as you try to move fluidly.

Carrying bulky objects, such as a wallet in a back pocket, can also compress the piriformis and the sciatic nerve, causing irritation, inflammation, spasm, and trigger points. Wearing tight pants low on the hips can put pressure on the sacrum, compressing the sciatic nerve as well as putting pressure on the lateral femoral cutaneous nerve at the anterior superior iliac spine, which may cause numbness and tingling in the anterior and lateral leg. Wearing high heels can contribute to atypical

Figure 9-3 Valgus of the knees and medial rotation of the hips.

postures that contribute to hyperlordosis and piriformis syndrome. Dancers are often trained to adjust their posture to accentuate lateral rotation in the hips and plantar flexion of the ankle. A dancer who is still performing is unlikely to agree to therapy that restores a more balanced posture. The structures causing pain or other symptoms can be treated, although it may be necessary to omit any techniques intended to adjust posture, such as releasing deep fascial restrictions or fully lengthening the lateral rotators. In this case, the client is at risk for recurring symptoms.

Trauma, such as a fall or car accident, can cause inflammation of the piriformis, irritation to the nerves and vessels, and scar tissue formation. Trauma may also cause myositis ossificans—a calcification in the muscle that can induce symptoms of piriformis syndrome. Consult your pathology book for massage cautions and contraindications for clients with myositis ossificans. Other contributing factors include hip replacement, an aneurysm of the gluteal artery, degenerative disc disease, facet irritation, or bursitis at the greater trochanter. Consult the client's health care provider to determine the best treatment plan in these cases.

Other factors associated with nerve impairment include obesity, hypothyroid condition, arthritis, diabetes, gout, hormonal changes, lymphedema, rheumatoid arthritis, lupus, and Lyme disease. In these cases, the symptoms may quickly resolve once the associated condition is controlled. During pregnancy, body fluids and abdominal size increase while the center of gravity changes, which may contribute to compression that is likely to resolve after childbirth. Smoking cigarettes—although it is not a cause of piriformis syndrome—exacerbates the inflammatory process and thus can intensify the symptoms. Alcoholism, poor nutrition, vitamin B deficiency, and general stress may also contribute to nerve impairment.

Because so many potential factors contribute to peripheral neuropathies, it is essential to understand the client's health history before proceeding with treatment. Many of the conditions listed above involve contraindications for massage therapy or require adjustments to treatment. Moreover, when a systemic condition is a contributing factor for a peripheral neuropathy, particularly if that systemic condition is not being monitored by a health care provider, massage therapy alone may bring only temporary relief of symptoms. Refer the client to their health care provider for medical assessment if you suspect a systemic condition, and discuss massage treatment plans with the health care provider if such a condition is diagnosed.

Table 9-1: Differentiating Conditions Commonly Confused with or Contributing to Piriformis Syndrome

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Sacroiliac joint dysfunction	Pain in the low back, hip, or pelvis Postural deviations Atypical gait	Physical exam Stork (Gillet's) test Gaenslen's test Yeoman's test X-ray	Massage therapy is indicated when the cause is neuromuscular. Consult with the health care provider if an underlying cause is suspected
Bursitis at greater trochanter	Aching in hip Pain worsens with movement or when lying on the affected side Feeling of swelling or fullness in the hip Skin is warm to the touch	Physical exam X-ray MRI	Massage therapy is systemically contraindicated if bursitis is due to infection. Massage is locally contraindicated in the acute stage to avoid increased swelling. In the subacute stage, massage to structures surrounding the joint is indicated.
Herniated lumbar disc	Muscle spasm Weakness or atrophy Low back pain Pain in buttocks, legs, and feet worsen when coughing, laughing, or straining Numbness and tingling in legs and feet	Physical exam including muscle reflexes and strength Straight leg raise test X-ray, CT, MRI, Electromyography (EMG) Myelogram	Massage therapy is indicated with caution and proper training. Work with the health care team.

Table 9-1: Differentiating Conditions Commonly Confused with or Contributing to Piriformis Syndrome (continued)

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Nerve root compression (radiculopathy)	Muscle spasm, weakness, or atrophy Pain radiates to the extremities	Kemp's test Valsalva's test Neurological exam to test reflexes, sensation, and strength	Massage therapy is indicated if the cause and location of the compression are understood. Take care not to increase the compression or reproduce symptoms.
Diabetes	Frequent urination, frequent thirst, increased appetite, fatigue, nausea	Physical exam Fasting blood sugar test	Massage therapy is indicated when tissues and circulation are not compromised.
Myositis ossificans	Local mass that is hard and tender Limited ROM in joint involved	Physical exam X-ray	Massage therapy is locally contraindicated to avoid increased bleeding. Working around the edges of the injury may stimulate reabsorption.
Lumbar spinal stenosis	Pain and cramping in the legs Radiating back or hip pain Numbness, tingling, or weakness in the leg or foot Balance disturbance Loss of bowel or bladder function	Physical exam Spinal X-ray MRI CT scan or myelogram Bone scan	Massage therapy is indicated with caution. Work with the health care provider. Client may receive corticosteroid injections or may be using anti-inflammatory medication.
Spondylolisthesis (begins in the lumbar region and proceeds to the thoracic spine)	Lumbar hyperlordosis Pain in low back, buttocks, and thighs Stiff back	X-ray Straight leg raise test	Massage is indicated. Stretching and strengthening are encouraged.
Spinal or sciatic tumors	Pain in the back, hips, legs, and feet Loss of sensation or weakness in legs Difficulty walking Decreased sensitivity Loss of bowel or bladder function Varying degrees of paralysis Scoliosis or spinal deformity	MRI CT scan PET scan CBC Myelogram Biopsy	Refer to the health care provider if you suspect a tumor. Work with the health care provider if a tumor is diagnosed. Recommendations for massage depend on the type and location of the tumor.
Pudendal nerve irritation	Pain in the groin, genitals, and rectum Constipation Pain and straining during bowel movements Straining or burning when urinating Painful intercourse Sexual dysfunction	Pudendal nerve motor latency test (PNMLT) Electromyography (EMG) Diagnostic nerve blocks Magnetic resonance neurography (MRN)	Often the muscles of the pelvic floor are involved. Massage is indicated when treatment of these muscles is within the scope of practice for massage therapists. Work with the health care provider.

CONTRAINDICATIONS AND SPECIAL CONSIDERATIONS

First, it is essential to understand the cause of sciatic nerve symptoms. If a systemic condition is present, work with the client's physician, and consult a pathology text for massage therapists before proceeding. Following are a few general cautions:

- **Underlying pathologies.** Systemic conditions including diabetes, rheumatoid arthritis, and hypothyroidism may contribute to peripheral neuropathies. Spondylolisthesis or degenerative disc disease may be present. If you suspect an underlying condition (consult Table 1 and your pathology book for signs and symptoms), refer the client to their health care provider for medical assessment before initiating treatment. If the client is diagnosed with an underlying pathology that is not contraindicated for massage, work with the health care provider to develop a treatment plan that is appropriate for that individual.
- **Endangerment sites.** Be cautious near endangerment sites in the popliteal and femoral areas.
- **Reproducing symptoms**. Symptoms may occur during treatment if you manually compress the sciatic nerve or if the client's posture causes anatomic structures to compress them. If treatment produces symptoms, first adjust the client to a more neutral posture. If this does not relieve the symptoms, reduce your pressure or move away from the area. You may be able to treat around the site that reproduced the symptoms, but proceed with caution.
- **Treatment duration and pressure**. If the client is elderly, has degenerative disease, or has been diagnosed with a condition that diminishes activities of daily living, you may need to adjust your pressure as well as the treatment duration. Frequent half-hour sessions may suit the client better.
- **Positioning**. Use bolsters to position a client for comfort as well as to reduce postures that reproduce symptoms. In the supine position, reducing lateral rotation of the hips by placing bolsters at the lateral knee helps to keep the muscle closer to anatomic length and may facilitate access to the piriformis. If hyperlordosis is present, see the hyperlordosis chapter for guidelines.
- **Friction**. Do not use deep frictions if the client has an inflammatory condition such as rheumatoid arthritis or osteoarthritis, if the health of the underlying tissues is compromised, or if the client is taking anti-inflammatory medication. Friction creates an inflammatory process, which may interfere with the intended action of anti-inflammatory medication. Recommend that your client refrain from taking such medication for several hours prior to treatment if the health care provider agrees.
- **Injections**. If the client has had a steroid, Botox, or analgesic injection within 2 weeks of treatment, avoid that area. These injections reduce sensation and alter the physiology of the muscle, which may prevent the client from assessing your pressure adequately.
- **Tissue length**. It is important when treating myofascial tissues that you do not further lengthen those that are already stretched. Assess for myofascial restrictions first and treat only those that are clearly present. Likewise, overstretched muscles should not be stretched from origin to insertion. If you treat trigger points in overstretched tissue, use heat or a localized pin and stretch technique instead of full ROM stretches.
- **Hypermobile joints and unstable ligaments**. Be cautious with mobilizations if the client has hypermobile joints or if ligaments are unstable due to injury, pregnancy or a systemic condition.

MASSAGE THERAPY RESEARCH

A thorough literature review identified no peer-reviewed studies specifically on the benefits of massage therapy for piriformis syndrome. Much of the literature on the use of manual therapy to treat piriformis syndrome is found in textbooks and originates in other disciplines such as physical medicine, physical therapy, and chiropractic care. A closer examination is needed of the benefits of massage therapy applied to lengthen the tissues that are shortened and hypertonic along with self-care intended to strengthen the muscles that are lengthened and weak.

Several literature reviews explore the use of physical or manual therapy for relieving piriformis syndrome symptoms, although none of these offer specific treatment plans, and most cases involved surgery, Botox or other injections, and other interventions that include manual therapy only in an adjunctive role. The work of Travell and Simons (1999) explaining the role of trigger points in developing piriformis syndrome is sometimes mentioned, but the usual therapeutic intervention described to relieve trigger points is vapocoolant spray. "Massage Therapy and Restless Legs Syndrome" by Meg Russell (2007) mentions a relationship between piriformis syndrome and restless leg syndrome, but that study does not focus on symptoms specific to piriformis syndrome. In 2006, Peggi Honig received the Runner-Up Award from the Massage Therapy Foundation's Student Case Report Contest for her study, "A Case Report of the Treatment of Piriformis Syndrome: Applying Modalities of Therapeutic Bodywork." That study describes the case of a 43-year-old female with a history of chronic pain for a few years prior to this case study, whose symptoms of piriformis syndrome were reduced following massage therapy. Although the case study is unpublished, and a more comprehensive design may result in more conclusive findings, its outcome is encouraging.

Working with the Client

CLIENT ASSESSMENT

The symptoms of piriformis syndrome can be confused with more serious conditions, and a wide variety of possible factors can contribute to its development. All of these elements add up to many variations in how a client may present. For example, a client with lateral rotation of the hip who tends to stand with more weight on one leg may present with lateral flexion of the thorax, an elevated iliac crest, sacroiliac joint immobility, and rotation in the hips or spine affecting the latissimus dorsi, abdominal obliques, multifidi and rotatores, and the ligaments connecting the sacrum, pelvis, and spine. Hyperlordosis may also be present. What follows are common presentations for piriformis syndrome. However, it is essential to assess every involved joint to put together an accurate picture for each individual client.

Assessment begins with your first contact with a client. In some cases, this may be on the telephone when an appointment is requested. Ask in advance if the client is seeking treatment for a specific area of pain so that you can prepare yourself.

Table 2 lists questions to ask the client when taking a health history.

Table 9-2: **Health History**

QUESTIONS FOR THE CLIENT	IMPORTANCE FOR THE TREATMENT PLAN
Where do you feel symptoms?	The location of symptoms gives clues to the location of trigger points, injury, or other contributing factors. Radiating pain or numbness and tingling in the extremities indicate nerve involvement.
Describe what your symptoms feel like.	Differentiate between possible origins of symptoms, and determine the involvement of nerves or blood vessels.
Do any movements make it worse or better?	Locate tension, weakness, or compression in structures producing such movements.
Have you seen a health care provider for this condition? What was the diagnosis? What tests were performed?	Medical tests may reveal contributing factors as well as contraindications. If no tests were performed by the health care provider making a diagnosis, use the tests described later in this chapter for your assessment. If your assessment is inconsistent with the diagnosis, ask the client to discuss your findings with the health care provider or for permission to contact the provider directly.

Table 9-2: **Health History (continued)**

QUESTIONS FOR THE CLIENT	IMPORTANCE FOR THE TREATMENT PLAN
Have you been diagnosed with a condition such as osteoporosis, rheumatoid arthritis, or osteoarthritis?	Systemic conditions may contribute to signs and symptoms, may require adjustments to treatment, and may impact treatment outcomes.
Have you had an injury or surgery, or did your symptoms begin during a pregnancy?	Injury or surgery and resulting scar tissue may cause adhesions, hyper- or hypotonicity, and atypical ROM. Changes in posture during pregnancy may be a contributing factor.
What type of work, hobbies, or other regular activities do you do?	Repetitive motions and static postures that increase lateral rotation or abduction of the hip may contribute to the client's condition.
Are you taking any prescribed medications or herbal or other supplements?	Medication of all types may contribute to symptoms or involve contraindications or cautions.
Have you had a corticosteroid, Botox, or analgesic injection in the past 2 weeks? Where?	Local massage is contraindicated.
Have you taken a pain reliever or muscle relaxant within the past 4 hours?	The client may not be able to judge your pressure.
Have you taken anti-inflammatory medication within the past 4 hours?	Deep friction initiates an inflammatory response and should not be performed if the client has recently taken anti-inflammatory medication.

Postural Assessment

Allow the client to walk and enter the room ahead of you while you assess their posture and movements. Look for imbalances or patterns of compensation for deviations common with piriformis syndrome. Watch as the client climbs steps, looking for reduced mobility in the hips or whether the client favors one side. Assess for joint instability, limping, drop foot, lateral rotation of the hip, or hyperlordosis. Have the client sit to fill out the assessment form and watch to see if they lower into the chair cautiously or shifts around to find a comfortable position. Watch also as the client stands up to see if they are able to stand without assistance or if they lift out of the chair using the arms or by leaning on a stable surface.

When assessing the standing posture, be sure that the client is standing comfortably and naturally. If they deliberately try to stand in the anatomic position, you will not get an accurate assessment of their posture in daily life. In a postural assessment, you may notice a lateral rotation of the hips if the piriformis is short and hypertonic. Lateral rotation of one hip is often accompanied by rotation of the pelvis and slight flexion of that hip. The client may stand with the affected leg anterior to the unaffected leg so that one foot is in front of the other. Compensating patterns may include hyperextension in the knee of the unaffected leg, because the client shifts weight to that leg while favoring the affected hip. The client may also present with hyperlordosis; see the hyperlordosis chapter for postural assessment. If the client has sacroiliac joint dysfunction, they may have an elevated hip, rotation in the pelvis, or lateral flexion of the thoracic and lumbar spine. If the client's symptoms are due to overuse of the piriformis as an antagonist, you may observe medially rotated hips, knee valgus, and eversion of the ankle.

Figure 4 compares a healthy posture to a posture affected by piriformis syndrome due to short lateral rotators of the hip.

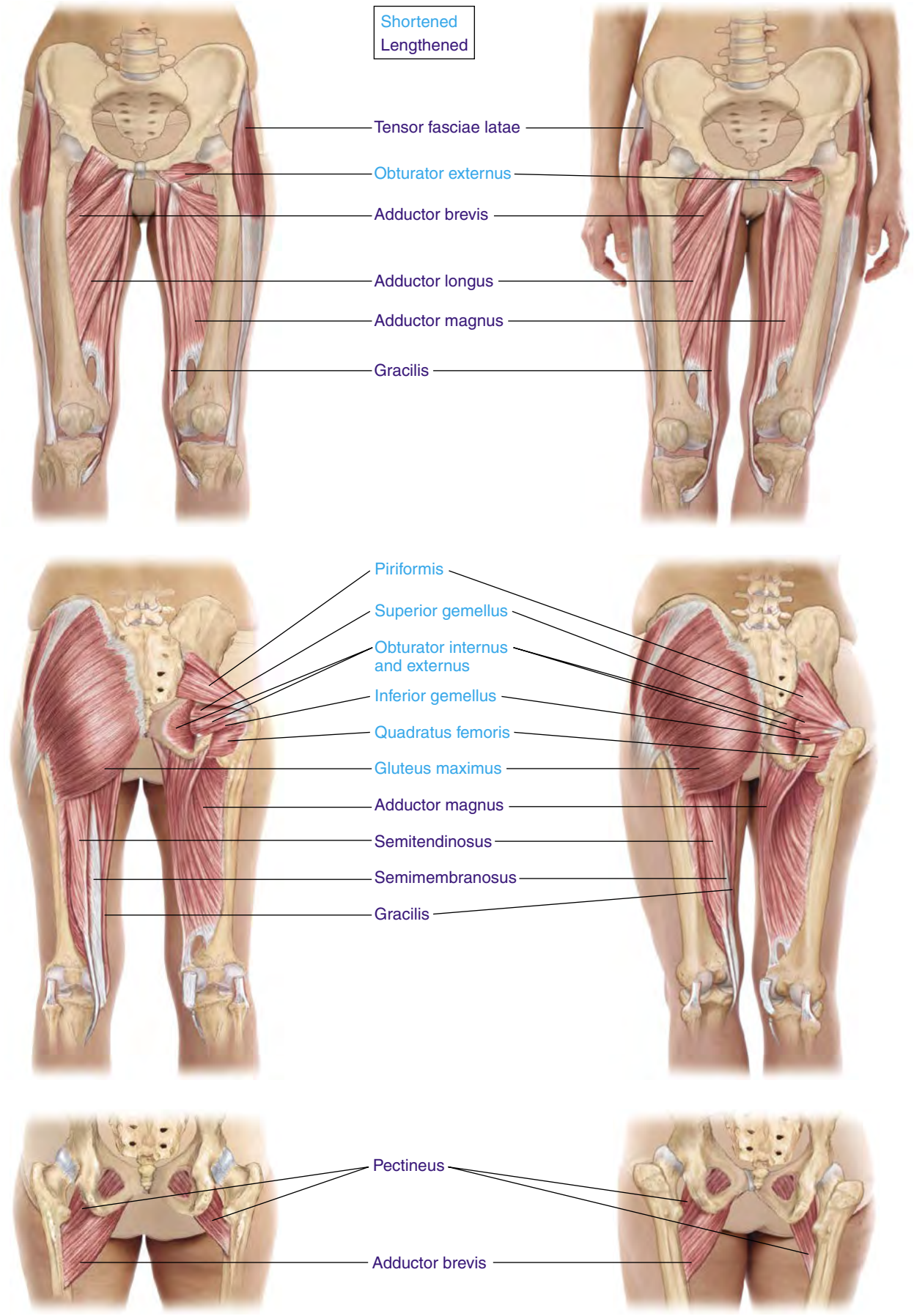


Figure 9-4 Postural assessment comparison. Compare the postures in these images. In the image on the right, note the lateral rotation in the right hip, tilting and rotation of the pelvis, and right lateral flexion of the thorax.

ROM Assessment

Test the ranges of hip motion that recruit the piriformis as either agonist or antagonist. Since it allows the client to control the amount of movement and stay within a pain-free range, only active ROM should be used in the acute stage of injury to prevent undue pain or re-injury. Box 1 presents the average active ROM results for the joints involved in piriformis syndrome.

Active ROM

Box 9-1: Average Active ROM for Joints Involved in Piriformis Syndrome

Hip

Flexion 110–120˚
- Rectus femoris
- Gluteus medius (anterior fibers)
- Tensor fasciae latae
- Sartorius
- Psoas major
- Iliacus
- Gluteus minimus
- Adductor magnus
- Adductor longus
- Adductor brevis

Extension 10–15˚
- Biceps femoris
- Semitendinosus
- Semimembranosus
- Gluteus maximus
- Gluteus medius (posterior fibers)
- Adductor magnus (posterior fibers)

Lateral Rotation 40–60˚
- Biceps femoris
- Gluteus maximus
- Gluteus medius (posterior fibers)
- Sartorius
- Piriformis
- Quadratus femoris
- Obturator internus
- Obturator externus
- Gemellus superior
- Gemellus inferior
- Psoas major
- Iliacus

Medial Rotation 30–40˚
- Semitendinosus
- Semimembranosus
- Gluteus medius (anterior fibers)
- Gluteus minimus
- Adductor magnus
- Adductor longus
- Adductor brevis
- Gracilis
- Pectineus
- Tensor fasciae latae

Hip (continued)

Abduction 30–50˚
- Gluteus maximus
- Gluteus medius
- Gluteus minimus
- Tensor fasciae latae
- Sartorius
- Piriformis (with flexed hip)

Adduction 30˚
- Adductor magnus
- Adductor longus
- Adductor brevis
- Pectineus
- Gracilis
- Psoas Major
- Iliacus
- Gluteus maximus (low fibers)

Trunk (at lumbar spine)

Flexion 50–60˚
- Rectus abdominis
- External oblique (bilateral)
- Internal oblique (bilateral)

Extension 25˚
- Spinalis (bilateral
- Longissimus (bilateral)
- Iliocostalis (bilateral)
- Multifidi (bilateral)
- Rotatores (bilateral)
- Quadratus lumborum (bilateral)
- Latissimus dorsi (with arm fixed)

Lateral Flexion 25˚
- Spinalis (unilateral)
- Longissimus (unilateral)
- Iliocostalis (unilateral)
- External oblique (unilateral)
- Internal oblique (unilateral)
- Quadratus lumborum (unilateral)
- Latissimus dorsi (unilateral)

Ipsilateral Rotation 20˚
- Internal oblique (unilateral)

Contralateral Rotation 20˚
- Multifidi (unilateral)
- Rotatores (unilateral)
- External oblique(unilateral)

Knee

Flexion 120–150˚
- Biceps femoris
- Semitendinosus
- Semimembranosus
- Gracilis
- Sartorius
- Gastrocnemius
- Popliteus
- Plantaris

Extension 0–15˚
- Rectus femoris
- Vastus lateralis
- Vastus medialis
- Vastus intermedius

Medial Rotation (when flexed) 20–30˚
- Semitendinosus
- Semimembranosus
- Gracilis
- Sartorius
- Popliteus

Lateral Rotation (when flexed) 30–40˚
- Biceps femoris

Ankle

Dorsiflexion 20˚
- Tibialis anterior
- Extensor digitorum longus
- Extensor hallucis longus

Plantar flexion 50˚
- Gastrocnemius
- Soleus
- Tibialis posterior
- Peroneus longus
- Peroneus brevis
- Flexor digitorum longus
- Flexor hallucis longus
- Plantaris

Inversion 45–60˚
- Tibialis anterior
- Tibialis posterior
- Flexor digitorum longus
- Flexor hallucis longus
- Extensor hallucis longus

Eversion 15–30˚
- Peroneus longus
- Peroneus brevis
- Extensor digitorum longus

Compare your assessment of the client's active ROM to the values in Box 1. Pain and other symptoms may not be reproduced during an active ROM assessment because the client may limit movement to a symptom-free range.

- **Active medial rotation of the hip** may be restricted and cause pain, numbness, and tingling when the piriformis is shortened.
- **Active lateral rotation of the hip** may reduce pain caused by medial rotation when the piriformis is short and tight. Although less common, active lateral rotation of the hip may be restricted or cause pain when the piriformis is overactive as an antagonist to the short and tight medial rotators of the hip or when it is recruited to stabilize the hip joint.
- **Active abduction of the hip.** If the piriformis is short and tight, active abduction of the hip may be weak, and the hip may laterally rotate during the movement. This test is best performed in the side-lying position.

Passive ROM

Compare the client's P ROM on one side to the other. Note and compare the end feel for each range.

- **Passive medial rotation of the hips** may be restricted and cause pain for a client whose posture or activities of daily living favor lateral rotation of the hips.
- **Passive lateral rotation of the hip** may reduce pain caused by medial rotation when the piriformis is short.

Resisted ROM

Use resisted tests to assess the strength of the muscles that cross the hip joint. Compare the strength of the affected side to the unaffected side.

- **Resisted lateral rotation and abduction of the hip** may cause pain in the low back, buttocks, and hip and numbness and tingling in the leg and may reveal weakness in the piriformis. The client may rotate the pelvis to compensate.

SPECIAL TESTS

The following special tests help to determine which muscles are contributing to pain and whether the client should be evaluated by a medical professional using X-ray or other tools, which may reveal conditions that are contraindicated or require special considerations when planning treatment with massage.

The **Valsalva maneuver** may reveal a herniated disc, tumor, or other factor that increases pressure on the spinal cord and is used when the client complains of pain in a localized area along the spine, particularly when coughing or sneezing. A herniated disc does not contraindicate massage, but this test is not specific for the cause of increased pressure. For this reason, if Valsalva maneuver is positive it is best to refer the client to a health care provider for further testing before performing the massage.

1. To avoid even a temporary reduction in circulation, do not perform this test if the client has tested positive for vertebral artery insufficiency or has cardiovascular disorders.
2. With the client seated facing you, ask them to take a deep breath and then attempt to forcefully exhale against the closed throat (such as when forcing a bowel movement).
3. The test is positive if the client feels pain in a localized spot along the spine. The client should be evaluated by a medical professional prior to receiving the massage.

Figure 9-5 Piriformis length test.

Figure 9-6 Pace test.

The **piriformis length test** assesses the length of the piriformis.

1. The client should lie prone with the knees and feet together and the knees flexed to 90°.
2. Instruct the client to keep the knees together while allowing the feet to fall naturally, unforced, to either side, which will medially rotate the hips and lengthen the piriformis (Fig. 5).
3. Compare the distance that each leg has moved from the midline. Notice whether one has moved further than the other.
4. The test is positive for a shortened piriformis on the side with less movement from the midline.

The **Pace test** is intended to assess the strength of the piriformis.

1. The client should be supine or seated with the knees placed together.
2. Place your hands on the sides of both knees, and ask the client to push the knees apart (abduct) against your resistance (Fig. 6).
3. Note weakness on either side. If the syndrome is unilateral, abduction on the affected side will be weaker than on the unaffected side.

The **stork test** is intended to assess sacroiliac joint mobility.

1. The client should stand near a stable surface or wall against which they can lean to maintain balance during the test.
2. Begin on the side you suspect is dysfunctional, but it is best to compare the results of both sides.
3. Kneel or sit behind the standing client with one thumb on the posterior superior iliac spine of the affected side and the other thumb on the sacrum at the same level.
4. Instruct the client to flex the hip and knee on the affected side to 90° or within their comfort range (Fig. 7). Notice the relative movement of your thumbs as the client flexes the hip.

Figure 9-7 Stork test.

5. When the sacroiliac joint is normally mobile, the ilium should rotate posteriorly, moving the thumb on the posterior superior iliac spine inferiorly. The test is positive for decreased sacroiliac joint mobility if the thumb on the posterior superior iliac spine moves superiorly as the client flexes the hip.

Palpation Assessment

Assess the low back, gluteal area, and affected leg for atypical temperature, color, and texture. Compression of the sciatic nerve or the vessels feeding the soft tissues may cause cool skin, swelling, boggy texture, and even reduced hair growth. You may find adhesions around the attachment sites of the gluteal muscles and the lateral rotators of the hips. If bursitis is a contributing factor, the area around the greater trochanter may be hot and tender.

Palpate the gluteal muscles and the lateral rotators of the hip for tenderness, tone, and trigger points. Trigger points in the piriformis refer into the gluteal area and down the posterior thigh. If hyperlordosis is also present, see the hyperlordosis chapter for palpation guidelines.

If the client presents with an elevated iliac crest, sacroiliac joint dysfunction, or lateral flexion of the thorax or lumbar spine, assess the latissimus dorsi, quadratus lumborum, internal and external obliques, and thoracic and lumbar erector spinae. Although the focus here is on the muscles that are directly related to the postural imbalance seen in piriformis syndrome, it is essential to assess the synergists and antagonists in each ROM for these joints. For example, although the piriformis is a lateral rotator of the hip, it also abducts the hip. When it is short or otherwise compromised, any of its actions may be compromised, and any of the synergists and antagonists for each of its actions may be affected. In this example, you may find adhesions in the gluteal muscles and the lateral rotators. The biceps femoris, sartorius, and iliopsoas, which laterally rotate the hip, may also be short, adhered, or hypertonic. The medial rotators of the hip may be stretched due to the postural imbalance favoring lateral rotation and taut as a result of overwork as antagonists to lateral rotation. Overstretched muscles that may be adhered and contain trigger points include the semimembranosus, semitendinosus, adductor magnus, adductor longus, adductor brevis, gracilis, and pectineus.

Figure 9-8 Common trigger points associated with piriformis syndrome and their referral patterns.

CONDITION SPECIFIC MASSAGE

Since the causes of pain, numbness, and tingling in the low back and leg vary widely, the exact cause can be difficult to pinpoint and more than one condition may coexist. Systemic conditions such as diabetes may be a contributing factor to neuropathies and involve cautions or contraindications for massage therapy. If you feel uncertain whether the client's symptoms are caused by piriformis dysfunction, refer the client to their health care provider for medical assessment.

It is essential for the treatment to be relaxing. You are not likely to eliminate the symptoms associated with piriformis syndrome or any of the coexisting conditions in a single treatment. Do not attempt to do so by treating aggressively. Be sure to ask your client to let you know if the amount of pressure you are applying keeps them from fully relaxing. If the client responds by tensing muscles or has a facial expression that looks distressed, reduce your pressure. Remember that you are working on tissue that is compromised. Ask the client to let you know if any part of your treatment reproduces symptoms, and always work within their tolerance. Deep palpation of a trigger point may cause pain at the upper end of the client's tolerance. Explain this to your client, describe a pain scale, and suggest the level of pain that should not be exceeded; ask them to breathe deeply during the application of the technique. As the trigger point is deactivated, the referred pain will also diminish. Common trigger points and their referral patterns are shown in Figure 8.

If symptoms such as numbness and tingling are reproduced, you may be compressing the sciatic nerve. Adjust the client to a more neutral position, reduce your pressure, or move slightly off the area, and make a note about it, because this may help you understand more clearly exactly which neuromuscular condition is contributing to the client's symptoms.

The following are treatment suggestions for the more common presentation of piriformis syndrome caused primarily by the short, tight piriformis irritating the sciatic nerve. If the client has an acute injury, PRICE (protection, rest, ice, compression, and elevation) is the protocol. You may work conservatively proximal or distal to the site, but avoid the area of injury until the subacute or chronic stage.

Treatment Goals:

- Begin with the client in a prone position with the ankles bolstered. If one or both heels of the feet fall closer to the midline than the toes, suggesting that the hip is laterally rotated, try to straighten the leg and minimize rotation by placing bolsters on the outside of the thigh just above the knee.

- Apply moist heat to the gluteal area of the affected side if indicated. If both sides are affected, move the heat to the gluteal area on the other side after heating the first.

- Use your initial warming strokes to superficially assess the tissues from the trunk down to the feet. You should be able to minimally assess the tissues of the mid and low back, gluteal area, thigh, leg, and feet, which may help you to determine where to focus the time remaining after treating the lateral rotators of the hip.

- If you notice swelling around the low back or gluteal area, apply superficial draining strokes toward the nearest lymph nodes.

- Before applying emollient, assess for and treat myofascial restrictions across the thoracolumbar aponeurosis.


- Assess and treat hypertonicity and trigger points in the latissimus dorsi, lumbar erector spinae, and quadratus lumborum, particularly if hyperlordosis is also present. Assess and treat these briefly for the moment. You can return to treat the area again if time permits.

- Remove moist heat, and assess the tissues around the sacrum and greater trochanter for myofascial restrictions and release them. It may be difficult to assess the gluteal area for superficial myofascial restrictions because of the presence of adipose tissue. Superficial restrictions around the attachment sites may be addressed more readily.


- Treat the gluteal muscles for hypertonicity and trigger points. Knead the tissues along the full length of the iliac crest and sacrum and around the greater trochanter to treat the attachments of the gluteal muscles and lateral rotators. To release adhesions in the deeper gluteal muscles, use cross-fiber friction beginning at the sacrum and move toward the greater trochanter. Lengthen tissues in each of the fiber directions of all three gluteal muscles to assess and treat hypertonicity and trigger points.

- Once the gluteal muscles are treated sufficiently to access the deeper piriformis, begin your specific work. To find the piriformis, place your fingers midway between the middle of the sacrum and the greater trochanter. Flex the client's knee to 90°, and ask the client to pull the foot away from you against your resistance. This lateral rotation will cause the piriformis to contract under your finger.

- Once you have found the muscle, slowly lengthen it from origin to insertion. Assess for trigger points as you slowly stroke along the length of the piriformis.

- Treat trigger points if any are found. Trigger points in the piriformis are frequently found near the greater trochanter and near the sacrum. If your treatment reproduces symptoms, adjust the client's posture, lighten your pressure, or move slightly off the area. As you proceed with the treatment, symptoms may lessen allowing you to treat more directly.


- Assess the quadratus femoris, obturator internus and externus, and the gemellus superior and inferior for hypertonicity and trigger points. These are small, deep muscles that may be difficult to distinguish. Familiarize yourself with their fiber directions and work generally to increase their length if you are unable to access each one individually. Lengthen these muscles manually, and treat any trigger points found.

- Stretch the lateral rotators by stabilizing the sacrum with one hand while bending the client's knee to 90° and gently pulling the leg toward you with the other hand (medial rotation) (Fig. 9).

Figure 9-9 Passively stretch piriformis.

- If the lateral rotators seem resistant to stretch, use postisometric relaxation to encourage lengthening. Bend the knee 90° and minimally rotate the hip medially by bringing the leg closer to you to lengthen the lateral rotators. Instruct the client to laterally rotate the hip by pulling the leg away from you against your resistance and hold for 10 seconds, or less if you feel a tremor or other sign that the muscles are fatiguing. Hold the leg steady while the client releases the contraction; then slowly rotate the hip medially by drawing the leg closer to you as fully as you can within the client's tolerance.



- Treat the thigh and leg for hypertonicity and trigger points and to restore neuromuscular function. Irritation of the sciatic nerve and its branches can cause changes in the tone and strength of any of the muscles innervated by it. Assess for adhesions, hyper- or hypotonicity, and weakness, and treat accordingly. If the tone is diminished, use stimulating strokes to encourage an increase in tone.

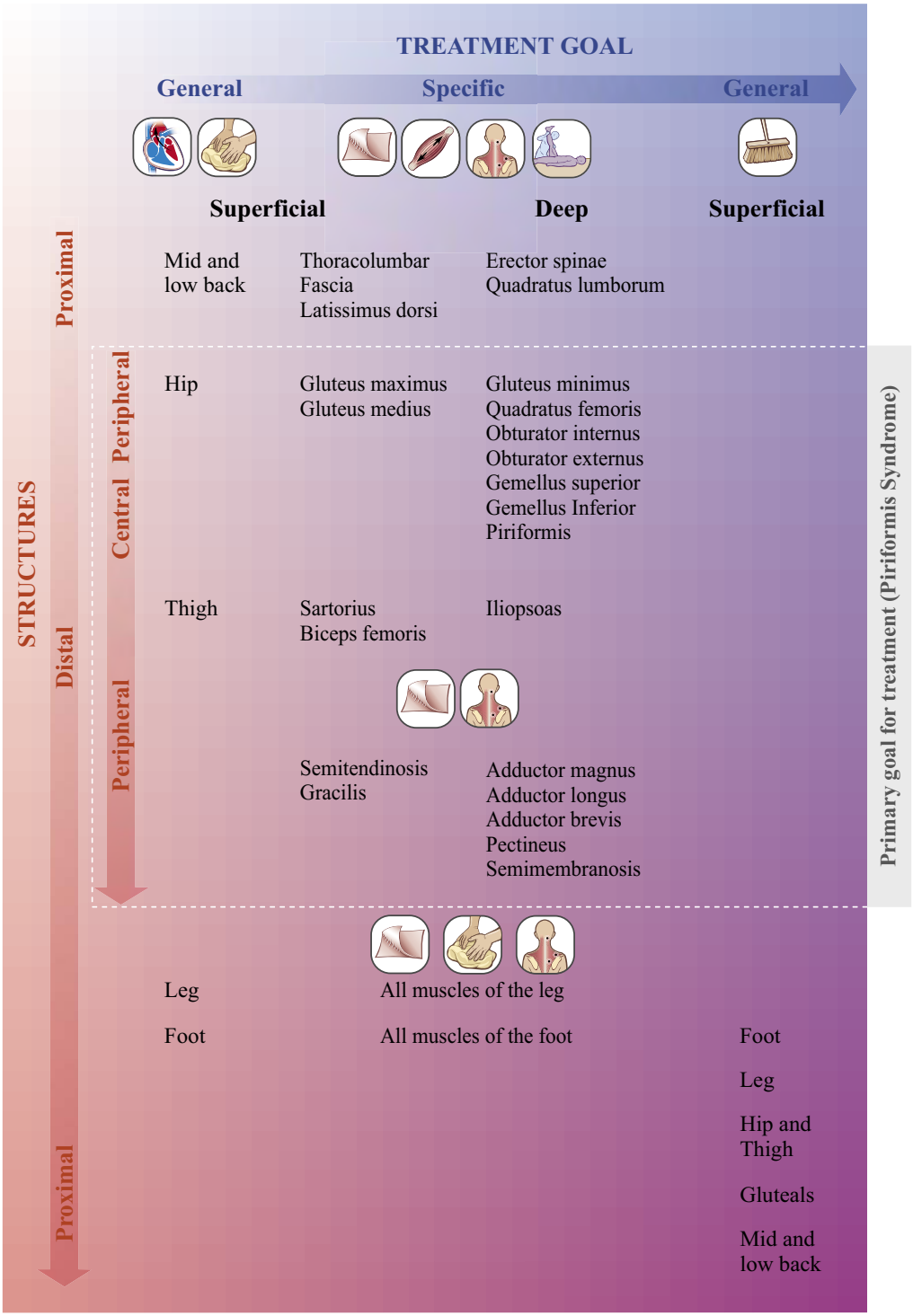
- Apply superficial gliding to the leg, thigh, and buttocks to clear the areas and encourage venous return.
- With the remaining time, consider the other possible conditions that may develop with piriformis syndrome and treat these. Hyperlordosis suggests treatment to the hip flexors and lumbar spine extensors. Eversion or inversion of the ankle suggests treatment to the muscles of the lower leg and feet. You may not have time to treat all of these fully, but you can pay attention to some of them in each session, and as the signs and symptoms of piriformis syndrome decrease, you can increase the amount of time you spend in these other areas.

CLIENT SELF-CARE

The following are intended as general recommendations for stretching and strengthening muscles involved in the client's condition. The objective is to create distance between the attachment sites of muscles that have shortened and to perform repetitions of movements that decrease the distance between the attachments of muscles that have weakened. If you have had no training in remedial exercises and do not feel that you have a functional understanding of stretching and strengthening, refer the client to a professional with training in this area.

Clients often neglect self-care because their daily lives are busy. Encourage them to follow these guidelines:

- Instruct the client to perform self-care throughout the day, such as while taking a phone call, reading e-mail, washing the dishes, or watching television instead of setting aside extra time. When performing activities while standing, ask the client to notice if they are shifting weight to one leg and whether the feet point outward (laterally rotated hips). If so, instruct the client to focus on distributing weight evenly to both legs and on keeping the toes pointed forward within their comfort level.
- Instruct the client on proper seated posture to keep pressure off the weakened joints. Sitting in a chair that supports the back and allows the client to rest the feet flat on the floor with the knees and hips flexed approximately 90° may reduce muscle strain and stress on the joints. To reduce lateral rotation in the hips while sitting for long periods of time, the client can place a band around the knees to keep them from separating.
- Encourage the client to remove any bulky objects from the back pockets of their pants, particularly when sitting.
- Encourage the client to take regular breaks from repetitive actions.



- Demonstrate gentle self-massage of the hip to keep adhesions and hypertonicity at bay between treatments.
- Demonstrate all strengthening exercises and stretches, and have the client perform these in your presence before leaving to ensure that they are performing them properly and will not be harmed when practicing alone. Stretches should be held for 15-30 seconds and performed frequently throughout the day, within the client's limits, during an active flare-up. The client should not force the stretch or bounce. It should be slow, gentle, and steady, trying to keep every other muscle as relaxed as possible.

Figure 9-10 Piriformis stretch.

Figure 9-11 Piriformis stretch.

Figure 9-12 Strengthen adductors.

Stretching

To stretch the lateral rotators of the hip, instruct the client to sit at the edge of the chair with the hips medially rotated by bringing the knees together and the feet resting away from the midline, and then have them lean forward (Fig. 10). Hold the stretch for 15–30 seconds, and then stand and take a few steps to mobilize the hip.

Alternatively, instruct the client to lie supine with the hip and knee of the affected side flexed and the hand of the opposite side rested on the flexed knee. Pull the knee of the affected side medially into a twist until a stretch is felt (Fig. 11). Hold the stretch for 15–30 seconds, and then stand and take a few steps to mobilize the hip.

Strengthening

The choice of strengthening exercises depends on which structures are lengthened or have lost tone. Compensating patterns may differ depending on the client's contributing factors and posture. Nearly all of the muscles of the posterior thigh, leg,

Figure 9-13 Strengthen abductors.

or foot can lose tone and strength when innervation by the sciatic nerve is reduced. Assess the client thoroughly to determine which structures are affected before assigning strengthening exercises.

Because lateral rotation is the most common postural deviation, you may find the medial hamstrings and adductors lengthened, taut, and weak. To strengthen these, instruct the client to lie supine with their feet on the floor, knees bent, and a ball or other object adding resistance between the knees (Fig. 12). Instruct the client to adduct and medially rotate the hip by squeezing the knees together against the resistance of the ball and hold for 10 seconds, or less if they feel fatigue. The contraction can be repeated 5–10 times.

If the Pace test is positive for weak abduction, recommend strengthening the abductors. Instruct the client to stand with the support of a wall or chair while lifting the affected leg away from the midline (Fig. 13). It is important not to laterally rotate the hip when performing this exercise to keep the piriformis from shortening.

SUGGESTIONS FOR FURTHER TREATMENT

Ideally, a client with piriformis syndrome will have treatments twice a week until the client can perform activities of daily living with minimal or no pain for at least 4 days. When this occurs, reduce frequency to once per week until symptoms are absent for at least 7 days. When the client reports that they have been pain free longer than 7 days, treatment can be reduced to twice per month. If the client is pain-free for 3 or more consecutive weeks, they can then schedule once per month or as necessary. In the treatment of piriformis syndrome that is neuromuscular in nature, there should be some improvement with each session. If this is not happening, consider the following possibilities:

- There is too much time between treatments. It is best to give the newly treated tissues 24–48 hours to adapt, but if too much time passes between treatments in the beginning, the client's activities of daily living may reverse any progress.
- The client is not adjusting activities of daily living or is not keeping up with self-care. As much as we want to fix the problem, we cannot force a client to make the adjustments we suggest. Explain the importance of their participation in the healing process, and encourage the client to follow your recommendations, but be careful not to judge or reprimand a client who does not.
- The condition is advanced or involves other musculoskeletal complications that are beyond your basic training. Refer this client to a massage therapist with advanced clinical or medical massage training. Continuing to treat a client whose case is beyond your training could turn the client away from massage therapy altogether and hinder healing.
- The client has an undiagnosed, underlying condition. Discontinue treatment until the client sees a health care provider for a medical assessment.

If you are not treating the client in a clinical setting or private practice, you may not be able to take them through the full program of healing. Still, if you can bring some relief in just one treatment, it may encourage the client to discuss this change with a physician and seek manual therapy rather than more aggressive treatment options. If the client returns for regular treatments, the symptoms are likely to change each time, so it is important to perform an assessment before each session. Once you have released superficial tissues in general areas, you may be able to focus more of your treatment on a specific area. Likewise, once you have treated the structures specific to piriformis syndrome, you may be able to pay closer attention to compensating structures and coexisting conditions.

Professional Growth

Case Study

Vittorio is a 35-year-old, single male. He is currently the marketing director for a nonprofit arts organization. Vittorio trained and performed as a professional ballet dancer until his retirement from dance 4 years ago. Within a year of retiring, he began feeling general aches in his hips, knees, and ankles. The symptoms have gotten worse, and he now feels numbness in his left leg and foot.

SUBJECTIVE

The client complained of pain in his hips, particularly in the left hip, with occasional general aching in his knees and occasional instability in his ankles. Approximately 6 months ago, he began to feel tingling down the back of his left leg and in the left foot after sitting at his desk for an extended period or driving long distances. Within the past 6 weeks, he has felt numbness in the leg and feels like the step of his left foot is heavier than the right. He has lost his balance more than once while taking the first few steps after having been seated for a while. In his job as a marketing director, he spends many consecutive hours seated. He commutes by car for an average of 1 hour in each direction and frequently drives to meetings. On the weekends, he is much more active, rarely uses his car, and has noticed that he has fewer symptoms. He has purchased a new chair with lumbar support and adjustable height to try to relieve symptoms. The use of this chair reduced the pain he had felt in his low back but had no effect on the pain, numbness, or tingling in his leg.

Vittorio visited his health care provider for a general checkup and to discuss the symptoms in his leg. He was concerned that changes in his diet, which now includes more packaged and take-out food, may be affecting his nervous system. A physical exam and blood tests revealed no underlying pathologies. He is considered to be in "excellent health." His health care provider explained that while his current food choices may contribute to his symptoms and may make healing less efficient, they are not the cause of his pain. The health care provider prescribed physical therapy, which largely focused on strengthening exercises and reduced the pain in his knees and ankles, but Vittorio noticed that the numbness and tingling was often worse after sessions. His former dance instructor referred him to this clinic. When asked about changes in bladder or bowel movements, he replied that nothing had changed. He has no pain in the groin area. He has noticed no swelling, and does not feel unusual heat, cold, or fullness in the extremities.

OBJECTIVE

The client very clearly protects his left leg. He climbed the stairs using the rail on the left side, lifting his weight with the right leg for each step. When seated, his knees are widely separated. A bulge in the left pocket of his jeans suggests a large wallet or other object. A faded area of fabric around the edges of this bulge suggests that he carries this object in the same pocket regularly. Vittorio had no trouble sitting in the chair. He stood without assistance, but paused for a second, seemingly to check his balance, before walking again. Other than the widely separated knees, his seated posture is well balanced and erect.

Postural assessment revealed a significant lateral rotation of the hips bilaterally. When this was pointed out to Vittorio, he stated that he had trained for years to establish that posture, which is essential for a ballet dancer. I have worked with several dancers who specifically requested that the lateral rotation of the hips not be realigned, but Vittorio responded, "I don't need it anymore," with no apparent regret. He has minor hypolordosis and valgus of the knees. The ankles are everted bilaterally, and the lateral two or three toes are slightly extended (i.e., not fully rested on the floor). The posture of the upper body is normal.

His Valsalva test was negative for space-occupying lesions. The Pace test revealed significant weakness with abduction of the left hip. When asked to try to increase the strength of the contraction in the left hip, Vittorio rotated his trunk to compensate. Although his right hip is stronger, this result is relative. The stork test was negative for sacroiliac joint dysfunction. Active medial rotation of the hips reproduced no symptoms at first, but tingling began at 24 seconds.

Palpation revealed fascial restrictions across the hip joint bilaterally and at the thoracolumbar fascia. No swelling or temperature difference was apparent between the hips. The lateral rotators of both hips have increased tone. Only the lateral rotators of the left hip were tender to the touch. With deep palpation, pain reached a level 8 out of 10. Trigger points near both attachments referred pain within the gluteal area. Pain with compression to a trigger point near the trochanter reduced from level 8 to 5. Pain with compression to a trigger point near the sacrum reduced from level 7 to 3. The iliotibial bands are dense and adhered bilaterally, particularly on the superior aspect of the left. The left vastus lateralis is also dense with superficial adhesions. The adductors and medial hamstrings are tender to the touch (level 4 of 10) with taut bands. There is point tenderness near the adductor tubercle and medial condyle of the femur and the medial tibial plateau (level 6 of 10). The peroneus longus and brevis and extensor digitorum longus are hypertonic bilaterally. Distal tendons of the extensor digitorum longus are thick and short. Biceps femoris and ankle dorsiflexors are slightly hypotonic, and sensation is reduced compared to the right side.

The assessment suggests possible piriformis syndrome—neurogenic in the left hip and non-neurogenic in the right hip. The client was encouraged to discuss this assessment with his health care provider for a specific diagnosis.

ACTION

Treatment focused on reducing hypertonicity and restoring the proper length of the lateral rotators of the hip bilaterally with the additional goal of reducing irritation to the left sciatic nerve. I performed myofascial release to the thoracolumbar fascia and around the greater trochanters. I used cross-fiber friction on the iliotibial bands and vastus lateralis bilaterally. I softened the superficial tissues moderately, but the fibers were still obscured by adhesions. I applied general warming to the gluteal area followed by muscle stripping and trigger point therapy on the lateral rotators of the hips bilaterally. P ROM in the right hip increased by approximately 158 with no pain upon medial rotation. P ROM in the left hip increased by less than 108 with pain at a level 5 out of 10 upon medial rotation and with tingling in the thigh after 15 seconds in the initial attempt. PIR increased P ROM by only a few degrees, and all successive passive medial rotation of the left hip was confined to 10 seconds. No trigger points were found in the taut bands of the adductors semimembranosus and semitendinosus. Adhesions and warmth at the medial knee suggest strain on the pes anserinus tendon due to excessive lateral rotation and attempts by the medial rotators to oppose the action. The client felt no tenderness in the anterior leg, but the density of the peroneals and extensor digitorum and the minimal change in tissues following the application of superficial techniques limited the depth and pressure attempted in this session. The client felt an intense stretch with a passive inversion of the ankle. I applied stimulating strokes to the left biceps femoris and ankle dorsiflexors.

Following treatment, the client stated that he felt greater mobility in the hips and legs but did not feel confident enough to stop favoring the left leg. I explained that rushing into false confidence in his strength and stability could have negative consequences and that he should trust his instinct and sense of balance when standing or walking but do his best not to favor one side if it is not necessary.

PLAN

I demonstrated a stretch for the lateral rotators of the hips while seated. I recommended wrapping a band around the knees while he is seated for long periods to reduce the lateral rotation of the hips. I emphasized the importance of limiting the duration of stretches and removing the band around his knees if numbness, tingling, or pain beyond his tolerance occurs. Results during treatment suggested that stretches should be limited to 10-15 seconds to minimize the reproduction of symptoms. If, at any time, symptoms occur within 5 or fewer seconds, the client was advised to discontinue performing this stretch. We will reevaluate this recommendation in the next session.

I demonstrated stretches to the ankle evertors, emphasizing that these should be performed only if the client feels stable while standing and only with the assistance of a wall or other surface to lean on. If continued treatment reduces symptoms during activities of daily living, and as stability and balance are restored, strengthening exercises for the biceps femoris and the dorsiflexors of the ankle will be introduced.

The client's primary goal is to stop the loss of control he feels in his left leg. His secondary goal is to restore strength. His long-term goals are to realign the hips, knees, and ankles, although this is not a priority. He has agreed to treatments twice a week until symptoms are absent for at least 4 consecutive days, with reassessment at that time. Massage therapy prescribed by a health care provider is covered under his insurance. He will discuss this with his health care provider and request a referral to this clinic.

CRITICAL THINKING EXERCISES

1. Design an assessment and treatment plan that considers the contributing factors for a client with symptoms of piriformis syndrome due to overuse of the piriformis as an antagonist. This client will likely present with medial rotation of the hips, valgus of the knees, and eversion of the ankle. The assessment plan should consider ROMs that may be restricted, testing for muscle weakness, and palpation findings. Treatment goals should include lengthening shortened tissues, strengthening weak muscles, and restoring proper neuromuscular function.
2. A client presents with numbness and tingling in the legs and pain in the hip, low back, and groin. The client also reports having recently developed urinary difficulty. Symptoms suggest both sciatic and pudendal nerve irritation. Conduct a short literature review of manual therapy for restoring the function of the pudendal nerve. Develop a treatment plan for this client with special attention to aspects of treatment both within and outside the massage scope of practice. Include possible referrals to practitioners licensed to treat elements of this condition that are outside the scope of practice for massage therapists.
3. Develop a 10-minute stretching and strengthening routine for a client that covers all of the muscles involved in piriformis syndrome. Use Box 9-1 and Figure 9-4 as a guide. Remember that a stretch increases the distance between the origin and insertion of a muscle and is important for those muscles that are shortened while strengthening is performed by actively bringing the origin and insertion closer together and is important for the antagonists of shortened muscles. Describe each step of the routine in enough detail that the client can refer to these descriptions in your absence and perform them without harm.
4. A client calls to schedule a massage for hip pain with tingling down the back of the leg. She explains that she had a hip replacement following an accident 5 years ago when she was 22 years old. Her physician has cleared her for massage therapy. Discuss the possible relationship between the hip replacement and piriformis syndrome. What questions would you ask this client and her health care provider? What special considerations would you need to make in your treatment plan both for contributing factors and for contraindications? Would a hip replacement affect proprioception at that joint?

5. Conduct a short literature review to explore the relationship between symptoms suggesting compression of one or more nerves in the gluteal area and the following:
   - Facet joint irritation
   - Diabetes
   - Prostatitis
   - Myositis ossificans
   - Rheumatoid arthritis

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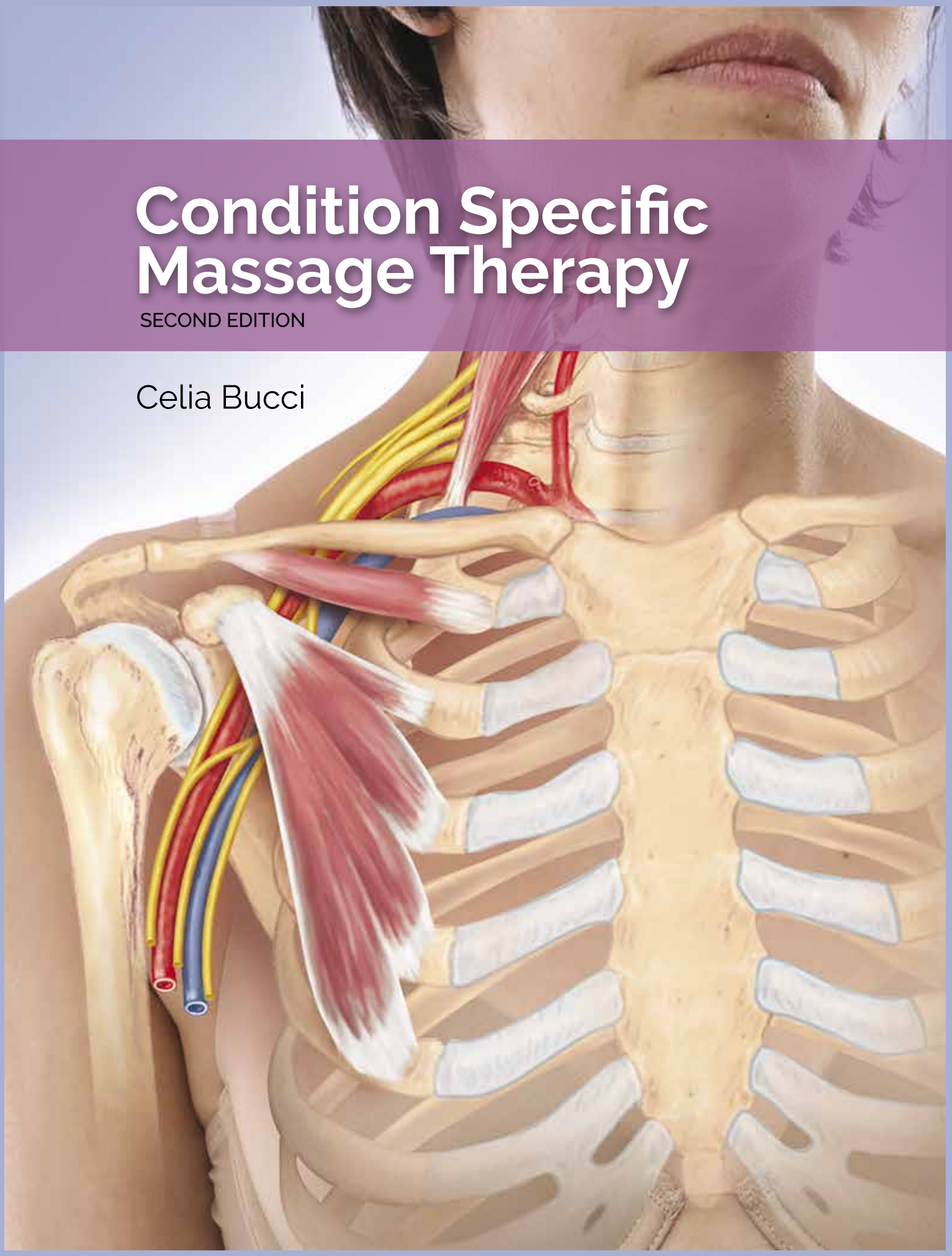
Condition Specific Massage Therapy

SECOND EDITION

Celia Bucci



Chapter 10:

Patellofemoral Syndrome

Patellofemoral Syndrome

Understanding Patellofemoral Syndrome

Patellofemoral syndrome refers generally to anterior knee pain primarily due to improper tracking of the patella over the femur. Many factors can affect the tracking of the patella, and the degree of discomfort, pain, or restricted mobility varies widely. To recognize these potential contributing factors, it is important to understand the relationships among the femur, tibia, patella, and the soft tissues responsible for their movement and stability.

The knee joint includes two articulations. The concave plateaus of the tibia and the convex condyles of the femur articulate to form a modified hinge joint (tibiofemoral). The posterior aspect of the patella also has concave surfaces—called the medial and lateral facets—that articulate with the medial and lateral condyles of the femur (patellofemoral). The ridge that separates the medial and lateral facets of the patella glides in the groove between the medial and lateral condyles of the femur. Articular cartilage that covers the condyles of the femur and the tibial plateau, and the menisci that sit between them provide cushioned, friction-free movement of the joint.

Flexion and extension of the knee, which involve both of these articulations, are not simple transverse movements. Some rotation and translation of the bones occurs during flexion and extension of the healthy knee. The angle of the joint and the strength of its surrounding structures influence the amount of rotation and translation. Noncontractile soft tissues including the medial and lateral collateral ligaments and the anterior and posterior cruciate ligaments protect the knee from excessive rotation and translation during movement. Other noncontractile tissues that protect the knee include the joint capsule, menisci, bursae, and fat pads (Fig. 1). Contractile soft tissues that both move and stabilize the knee include the quadriceps, hamstrings, gracilis, sartorius, and gastrocnemius. A healthy knee depends on all of these structures working together to create smooth movement.

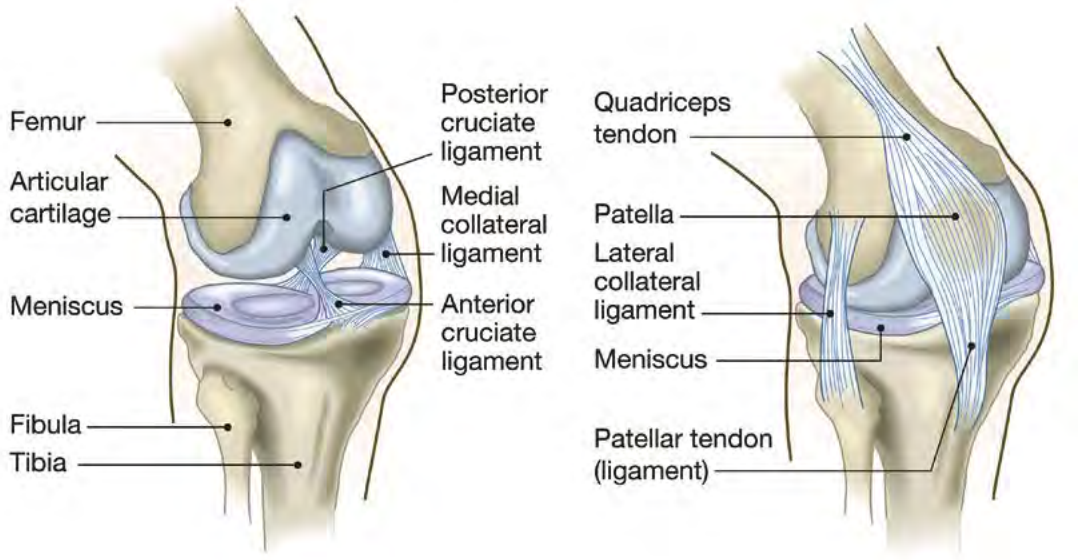


Figure 10-1 Supporting structures of the knee
Image credit: Axel Kock/Adobe Stock

The lateral condyle of the femur is more prominent anteriorly than the medial condyle, which provides a buffer for excessive lateral movement of the patella. The medial condyle of the femur extends more distally than the lateral condyle, but both lie in the same plane as they articulate with the tibia. This puts the femur at an angle from the inferior medial location of the knee to the superior lateral location of the hip. The angle at the intersection of those differently oriented bones—called the Q angle—partly determines how the quadriceps pull on the tibia in knee extension and how they contract eccentrically in knee flexion. To measure this angle, draw one line diagonally from the middle of the patella to the anterior superior iliac spine (ASIS), and another from the middle of the patella through the middle of the tibial tubercle (Fig. 2). The average Q angle is approximately 15°; it is often greater in females than in males, because women generally have a wider pelvis. Because the Q angle affects the line of pull of the quadriceps, significant deviations can have a great impact on how the bones of the knee joint articulate and how the soft tissues respond. In the case of patellofemoral syndrome, an increased Q angle—sometimes resulting from an injury, activities of daily living, or postural deviations anywhere from the hips to the feet—may contribute to excessive lateral tracking of the patella.

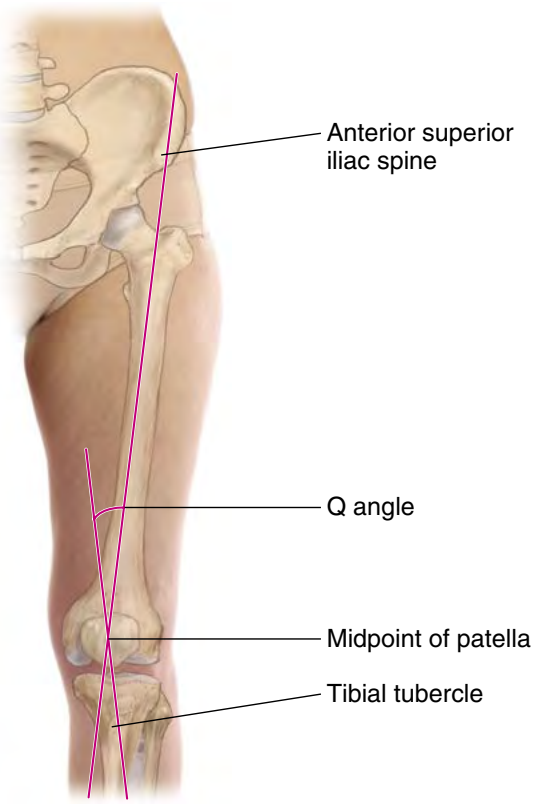


Figure 10-2 Q angle.

The quadriceps are also angled, following the line of the femur. The patella is rooted in the quadriceps tendon, is stabilized inferiorly by the patellar tendon, and is further stabilized by the medial and lateral retinacula. In extension and flexion of the knee, the patella moves superiorly and inferiorly over the condyles of the femur. The main function of the patella is to help guide the movement of this joint with differently angled bones by realigning the quadriceps' pull on the tibia. Without the patella, the quadriceps would draw the tibia diagonally, along their line of pull. Instead, the quadriceps move the patella slightly laterally along the line of the femur, while the patellar tendon redirects the line of pull on the tibia, moving it more perpendicularly and minimizing rotation. If the patella is not tracking normally, stress to the joint and the muscles that move it increases.

Because the quadriceps' line of pull is lateral compared to the orientation of the patellar tendon, several other structures are vital for proper tracking of the patella. The distal fibers of the vastus medialis run obliquely, offering ideal resistance to a lateral pull on the patella. The medial patellar retinaculum resists lateral pull while the lateral patellar retinaculum resists medial pull. The medial and lateral collateral ligaments assist in normalizing a valgus or varus position of the knee, which may help to prevent improper tracking of the patella.

COMMON SIGNS AND SYMPTOMS

The most common symptom of patellofemoral syndrome is pain at the anterior knee, often just above or just below the patella. Pain usually has a gradual onset. Pain may also be felt at the medial or lateral side of the knee depending on which structures are primarily involved. Pain is usually most intense with a weight-bearing extension of the knee. Symptoms are felt when walking, running, squatting and rising from a squat, and when ascending and descending stairs. While sitting for long periods, the knee is flexed, elongating the quadriceps, and pain may be felt upon standing when the lengthened quadriceps need to contract concentrically. The knee may also give way during weight-bearing activities. While instability of the joint may be a complicating factor in patellofemoral syndrome, the knee giving way may also be the result of a neuromuscular reflex inhibition of the quadriceps in response to pain. This inhibition may lead to atrophy of the quadriceps.

Hyper- or hypomobility of the patella in a lateral or medial direction may be present. When structures are pulling the patella laterally, medial mobility may be reduced. When structures are pulling the patella medially, lateral mobility may be reduced. You may notice swelling at the knee when misalignment of the patella and factors contributing to patellofemoral syndrome increase friction and lead to increased inflammation and arthritis. Snapping or grinding may be felt or heard by the client when flexing and extending the knee, particularly during weight-bearing activity.

Patellofemoral syndrome was once called (and is still often confused with) chondromalacia of the patella, which involves degeneration of cartilage. The signs and symptoms listed above are often present without any changes to the cartilage of the patella. However, left untreated, patellofemoral syndrome may lead to degeneration of the patellar cartilage.

POSSIBLE CAUSES AND CONTRIBUTING FACTORS

There is no single, clearly understood cause of patellofemoral syndrome. Improper tracking of the patella and increased pressure within the patellofemoral joint may involve a variety of coexisting contributing factors. Lateral misalignment of the patella is reported more often than medial misalignment. This is thought to be due to lateral pull by the quadriceps. An increased Q angle may contribute to excessive lateral pull by the quadriceps and rotation of the femur or tibia and may affect proper tracking of the patella. A tight vastus lateralis or iliotibial band, which have distal tissues that blend into the lateral patellar retinaculum, also increase lateral pull on the patella. The distal fibers of the vastus medialis, referred to as vastus medialis obliquus, run at an oblique angle, making them favorable for opposing lateral pull on the patella by the quadriceps and iliotibial band. A weak vastus medialis obliquus may not be optimally effective for this function. In all of these cases, weight-bearing or repetitive activities increase the demand on the knee and the risk of injury to its stabilizing soft tissues.

Try this yourself. Stand on one leg, leaning against a wall or chair for balance. Extend and flex the knee of the opposite leg. If there is no tissue damage, the movement of your knee will be smooth, and you probably will not feel any discomfort. Now, adduct your hip, crossing your free leg over the leg you are standing on, and extend and flex your knee 10 times so that movement of the tibia is straight and directly in front of you. This may not be the exact mechanism of an increased Q angle, but it approximates the rotation of the femur and the increased angle of pull on the quadriceps. Moving the tibia straight and directly in front of you approximates walking. After 10 repetitions of this action, do you feel stress in the medial knee or hip? Now imagine the additional impact on the joint if you added the full weight of your body. Next, without causing discomfort beyond your tolerance, walk around with one ankle everted or inverted. Pay attention to what you feel in that knee and hip compared to the leg with a normally oriented ankle and foot.

Sitting or squatting for long periods lengthens the quadriceps, particularly the distal tendons, which may weaken knee extension causing pain when the individual needs to recruit these muscles to stand. Lengthening may be associated with neuromuscular dysfunction, affecting the tone and strength of the quadriceps, which can cause the knee to give way. It is unclear whether the neuromuscular dysfunction is a cause or result of changes to the quadriceps' muscle tone. Along the same lines, the knee is usually flexed when sitting, which shortens and possibly increases the resting tone of the hamstrings. This may increase the risk of strain during eccentric contractions of the hamstrings such as when extending the knee to stand. Furthermore, if the quadriceps have weakened, they may be less able to oppose the hamstrings that flex the knee.

Although less common, medial misalignment does occur and should be assessed. In fact, any anomaly in the structures of the knee can affect patellar tracking in the femoral groove. Patella alta—a patella that is abnormally high in relation to the femur—is positioned in the more shallow aspect of the femoral groove and may be associated with lateral displacement. Patella baja—a patella that is abnormally low in relation to the femur—increases contact with the tibia and is associated with chondromalacia. Patella alta and patella baja are often associated with an injury to the quadriceps and patellar tendons. A lateral femoral condyle that is smaller

than average or that does not protrude sufficiently anteriorly cannot provide an adequate buffer for the patella and may also contribute to excessive lateral tracking.

Pes planus or pes cavus, inversion or eversion of the ankle, and rotation of the femur or tibia may all play a role in improper biomechanics that contribute to patellofemoral syndrome. Injuries, particularly to the ligaments that stabilize the knee, and more so if they are repeated or untreated, may affect the articulation of bones in the joints of the knee and encourage compensating patterns in the soft tissues surrounding the knee. Surgery, including arthroscopic procedures, may damage soft tissues, cartilage, and proprioceptors, resulting in scar tissue and compromised function. Overuse and weight-bearing impact, such as when running and ascending or descending stairs or hills, may contribute to inflammation and degeneration of structures. Weight gain may also be a predisposing factor.

Table 10-1: Differentiating Conditions Commonly Confused with or Contributing to Patellofemoral Syndrome

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Baker's cyst	May be asymptomatic Pain and swelling behind the knee If cyst ruptures, pain, swelling, and bruising at posterior knee and calf	Physical exam Transillumination X-ray MRI	Baker's cyst can be confused with deep vein thrombosis and should be assessed by a medical professional prior to treatment. Massage is locally contraindicated in the popliteal area. Massage elsewhere is indicated.
Bone spur	Pain in knee, particularly on flexion and extension and when kneeling Reduced ROM	X-ray MRI CT scan	Massage will not reduce symptoms of a bone spur. ROM testing or exercises are locally contraindicated. Be cautious with compressions.
Bursitis (pes anserine, infrapatellar, prepatellar)	Heat, redness, and swelling Pain at rest Aching or stiffness with use Significant pain when kneeling and ascending or descending stairs Fever, pain, and swelling if infection occurs	Physical exam ROM tests X-ray MRI	Massage is systemically contraindicated if bursitis is due to infection. Massage is locally contraindicated in the acute stage to avoid increased swelling. In the subacute stage, massage to structures surrounding the joint is indicated.
Chondromalacia	Dull pain and tenderness at the anterior knee Worsens with kneeling, squatting, prolonged sitting, standing from sitting, and ascending or descending stairs Crepitus	Physical exam X-ray MRI	Massage is indicated to reduce stress on the joint by altering soft tissues but will not affect cartilage. Avoid compression to the patella and repeated ROM exercises of the knee.
Gout	Redness, heat, and swelling Sudden, intense pain, often at night, that diminishes gradually over a couple of weeks	Physical exam Blood and urine uric acid concentration tests Synovial fluid test	Massage is contraindicated during acute attacks. Gout may indicate other systemic conditions. Work with health care team.

Table 10-1: Differentiating Conditions Commonly Confused with or Contributing to Patellofemoral Syndrome (continued)

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Iliotibial band syndrome	Sharp or burning pain in lateral knee, particularly following activity Pain resolves with rest in early stages As syndrome progresses, pain with simple activities like walking and ascending or descending stairs	Physical exam ROM tests	Massage is indicated.
Ligament injury/ sprain	Snapping sound or sensation at time of injury Acute pain that worsens with movement Rapid swelling, heat, and redness Unable to bear weight on the injured leg Knee gives way In the subacute stage, joint may regain function	Physical exam MRI	Massage is indicated and best used following acute stage. See chapter on ligament sprains.
Meniscus injury	Pain and stiffness Popping sensation Slowly progressive swelling Reduced ROM Pain with activity Knee may lock in place	Physical exam McMurray's test X-ray MRI Arthroscopy	Massage is indicated to reduce stress on the joint by altering soft tissues but will not affect meniscus. Avoid compression to the injured meniscus and the patella and minimize repeated ROM exercises of the knee.
Osgood-Schlatter disease (primarily affects teenagers)	Pain that worsens with activity Swelling Tenderness at tibial tuberosity Symptoms often resolve when bones stop growing	Physical exam ROM tests X-ray	Techniques that increase circulation are locally contraindicated in the acute stage to avoid increased inflammation. Massage is indicated in chronic stage.
Osteoarthritis	Pain on standing and walking Swelling Tenderness with pressure on joint Stiffness, particularly after rest or inactivity Inflexibility in the knee Grating sensation or sound	Physical exam X-rays Blood tests Synovial fluid tests Arthroscopy	Massage is contraindicated during an acute flare-up. Massage is indicated in the subacute stage.
Plica syndrome	Intermittent anteromedial knee pain Inflammation Edema Thickening of plica Decreased elasticity of plica Snapping sound when dense plica rolls over femoral condyle Knee may lock or give way	TARP sign (Taut Articular band Reproduces Pain) Arthroscopy	Massage is indicated to reduce inflammation or adhesions, restore mobility, and effect a change in the tone of muscles that cross the knee. There is no research to indicate the benefit of massage to the plica itself.

Table 10-1: **Differentiating Conditions Commonly Confused with or Contributing to Patellofemoral Syndrome (continued)**

CONDITION	TYPICAL SIGNS & SYMPTOMS	TESTING	MASSAGE THERAPY
Rheumatoid arthritis	Chondromalacia Periods of flare-ups and remission Pain, swelling Aching and stiffness, particularly after rest or inactivity Reduced ROM Distortion of knee joint Rheumatic nodules Occasional low-grade fever and malaise	Physical exam Blood tests Synovial fluid tests X-ray	Massage is indicated in nonacute stages. Work with the health care team.
Septic arthritis	Pain, swelling, redness, and heat around the knee Fever, chills Symptoms may occur without prior injury	Synovial fluid test Blood test X-ray MRI	Massage is systemically contraindicated. Refer to a medical professional.
Tendon injuries	Pain in the knee Swelling Pain worsens with intense weight-bearing activity such as jumping, squatting, or climbing stairs Reduced ROM	Physical exam ROM tests	Massage is indicated. See chapter on tendinopathies.

CONTRAINDICATIONS AND SPECIAL CONSIDERATIONS

First, it is essential to understand the cause of the client's knee pain. If the client has a history of arthritis, cartilage degeneration, or previously unresolved injuries, or if you suspect the client has a fractured bone or a torn ligament, work with the client's health care provider and consult a pathology text for massage therapists before proceeding. These are a few general cautions:

- **Underlying pathologies.** Arthritis or conditions affecting the cartilage may be contributing factors. If you suspect an underlying condition (consult Table 1 and your pathology book for signs and symptoms), refer the client to their health care provider for medical assessment before initiating treatment. If the client is diagnosed with an underlying pathology that is not a contraindication for massage, work with the health care team to develop a treatment plan that is appropriate for that individual.
- **Endangerment sites.** Be cautious near endangerment sites in the popliteal area.
- **Producing symptoms.** Symptoms may occur during treatment. If treatment reproduces symptoms, first adjust the client to a more neutral posture. If this does not relieve the symptoms, reduce your pressure or move away from the area. You may be able to treat around the site that reproduced the symptoms, but proceed with caution.
- **Treatment duration and pressure.** If the client is elderly, has degenerative disease, or has been diagnosed with a condition that diminishes activities of daily living, you may need to adjust your

pressure as well as the treatment duration. Frequent half-hour sessions may suit the client better.

- **Positioning.** Use bolsters to position the client for comfort as well as to reduce postures that contribute to patellofemoral syndrome or coexisting conditions. Adjusting the alignment of the hips, knees, and ankles helps to keep muscles closer to their anatomic length and may facilitate access.
- **Friction.** Do not use deep frictions if the client has a systemic inflammatory condition such as rheumatoid arthritis or osteoarthritis, if the health of the underlying tissues is compromised, or if the client is taking anti-inflammatory medication. Friction creates an inflammatory process, which may interfere with the intended action of anti-inflammatory medication. Recommend that your client refrain from taking such medication for several hours prior to treatment if the health care provider agrees.
- **Injections.** If the client has had a steroid or analgesic injection within 2 weeks of treatment, avoid the area. These injections reduce sensation, which may prevent the client from assessing your pressure adequately. These injections may also alter the physiology of the soft tissues, increasing the risk of injury from manual pressure.
- **Tissue length.** It is important when treating myofascial tissues that you do not lengthen those that are already stretched. Assess for myofascial restrictions first and treat only those that are clearly present. Likewise, overstretched muscles should not be stretched from origin to insertion. If you treat trigger points in overstretched tissue, use heat or a localized pin and stretch technique instead of full ROM stretches.
- **Hypermobile joints and unstable ligaments.** Be cautious with mobilizations if the client has hypermobile joints or if ligaments are unstable due to injury, pregnancy, or a systemic condition.

MASSAGE THERAPY RESEARCH

In 2006, Paul van den Dolder and David Roberts published a study titled "Six Sessions of Manual Therapy Increase Knee Flexion and Improve Activity in People with Anterior Knee Pain: A Randomised Controlled Trial." The participants were 38 individuals between the ages of 18 and 80 with anterior knee pain, who were assigned to either an experimental group that received manual therapy or to a control group whose subjects were placed on a waiting list. Participants were excluded if knee pain was caused by recent trauma, infection, tumor, or acute inflammation or if the participant had knee surgery within 6 weeks of the study. Participants were also excluded if pain was reproduced with extension, flexion, or lateral flexion of the lumbar spine or overpressure to the hip or if there was no tenderness on palpation of the lateral knee. Manual therapy consisted of six 15- to 20-minute treatments over the course of approximately 2 weeks. Therapy focused on transverse frictions to the lateral retinaculum of the knee in the fully extended and fully flexed positions, tilt patellofemoral stretches, and sustained medial glide during extension and flexion. Participants were given no self-care instructions or other healing advice. Pain was measured using Laprade and Culham's patellofemoral pain severity questionnaire. ROM and activity were also assessed. The experimental group reported less average daily pain, less pain, increased speed while ascending or descending stairs, and increased knee flexion compared to the control group. There was no change in knee extension for either group.

In 2009, Pedrelli et al. published a study titled "Treating Patellar Tendinopathy with Fascial Manipulation." All 18 subjects, who were between the ages of 17 and 42 with unilateral, subacute, or chronic patellar tendon pain, received a single treatment using the fascial manipulation technique. Subjects with acute inflammation, meniscus damage, or advanced osteoarthritis were excluded. Prior to treatment, subjects completed the VAS pain questionnaire, describing pain experienced while descending steps and while jumping on flat feet. Subjects were asked to refrain from sports for 4 days following treatment. The same evaluation was repeated after one treatment and again one month after treatment. All treatments were performed by the same therapist and included fascial techniques over the muscular fascia between the vastus lateralis and the rectus femoris with pressure applied toward the vastus intermedius. Client feedback was used to accurately locate the point that produced local pain and referral. All patients reported decreased pain or weakness or

increased mobility. All subjects reported a significant decrease in pain immediately following treatment, and progress was maintained or even improved at follow-up by all but three participants. These three subjects had a recurrence of pain, albeit less severe than at pre-treatment levels. It is also noted that these three subjects had more complicated clinical cases compared to other participants.

In 2008, Jennifer Zalta published "Massage Therapy Protocol for Post-Anterior Cruciate Ligament Reconstruction Patellofemoral Pain Syndrome: A Case Report." The study involved a 29-year-old female athlete with a history of injury to her anterior cruciate ligament, medial collateral ligament, and medial meniscus and had surgical repair of all but the medial ligament. After several months following surgery, the subject began experiencing grinding and clicking in the knee. She was later diagnosed as having patellofemoral pain syndrome. She scheduled arthroscopic surgery to remove the damaged cartilage and to reduce crepitus and agreed to participate in the case study beginning 4 days after her arthroscopy. Treatments were performed once a week over the course of 10 weeks, lasting between 60 and 90 minutes to accommodate a wide variety of contributing factors. Subjective pain and function levels were recorded before and after each treatment and daily during the treatment period. Goals included reducing postsurgical inflammation (lymphatic drainage); reducing hypertonicity and lengthening the tensor fasciae latae, iliotibial band, and hamstrings (muscle energy technique); deactivating trigger points in the tensor fasciae latae, vastus lateralis, and biceps femoris (neuromuscular therapy); increasing ROM (PIR and contract relax techniques); and reducing fibrotic tissue around the patella (myofascial release and cross-fiber friction). Strengthening of the vastus medialis oblique and the hip adductors were assigned as self-care. Following the treatment program, the client reported full, pain-free ROM in the affected knee. Pain was reported as 0 on a 0-10 scale by the sixth session. Lateral pull on the patella was reduced, and results of orthopedic tests showed improvement in the Q angle, tensor fasciae latae and iliotibial band contracture, patellar grind, and contracture in the knee flexors. Two weeks before the 1-year follow-up, the subject injured her medial meniscus, but reported that, prior to this most recent injury, she had experienced no pain and had returned to presurgery activity.

Working with the Client

CLIENT ASSESSMENT

The signs and symptoms of patellofemoral syndrome can present in many different ways. Dysfunction that causes the patella to track laterally is most often reported, but any abnormal tracking that results in pain or dysfunction of the patellofemoral joint may be present. In addition, various repetitive actions, postures, or injuries may be contributing factors; each client will present differently. For example, an increased Q angle may affect the length and strength of the hip adductors and abductors as well as inversion or eversion of the ankles. A tight semitendinosus may contribute to injury of the pes anserine tendon, which in turn may affect the health of the sartorius or gracilis. Tight hamstrings or quadriceps may also affect pelvic tilt and lumbar lordosis. In general, lateral tracking of the patella suggests shortening of the soft tissues of the lateral thigh and weakening of the medial structures that stabilize the knee while medial tracking of the patella suggests shortening of the soft tissues of the medial thigh and weakening of the lateral structures that stabilize the knee. What follows are common presentations for patellofemoral syndrome. However, it is essential to assess every joint involved to put together an accurate picture for each individual client.

Assessment begins during your first contact with a client. In some cases, this may be on the telephone when an appointment is requested. Ask in advance if the client is seeking treatment for a specific area of pain so that you can prepare yourself.

Table 2 lists questions that may aid your assessment.

Table 10-2: **Health History**

QUESTIONS FOR THE CLIENT	IMPORTANCE FOR THE TREATMENT PLAN
Was there a precipitating event, or can you remember a specific moment when the pain began?	The details of the activity or posture that initiated the pain may help you to determine contributing factors. A new regimen of running, new activity that requires weight-bearing movement or squatting, or newly developed sedentary postures may contribute to symptoms of patellofemoral syndrome.
Where do you feel symptoms?	The location of symptoms gives clues to the location of trigger points, injury, or other contributing factors. Patellofemoral syndrome generally causes pain in the anterior knee. Although pain elsewhere does not exclude the possibility of patellofemoral syndrome, it may suggest a coexisting condition.
Describe what your symptoms feel like.	Differentiate between possible origins of symptoms, and determine the involvement of bones and soft tissues.
Do any movements make it worse or better?	Locate tension, weakness, or compression in structures producing such movements. Extension of the knee, ascending and descending stairs, and weight-bearing activity often exacerbate symptoms.
Have you seen a health care provider for this condition? What was the diagnosis? What tests were performed?	Medical tests may reveal contributing factors as well as contraindications. If no tests were performed in making a diagnosis, use the tests described in this chapter for your assessment. If your assessment is inconsistent with the diagnosis, ask the client to discuss your findings with their health care provider or for permission to contact the provider directly.
Have you been diagnosed with a condition such as arthritis?	Arthritis may contribute to signs and symptoms, may require adjustments to treatment and may impact treatment outcomes.
Have you had a previous injury or surgery?	Injury or surgery and resulting scar tissue may cause adhesions, hyper- or hypotonicity, and atypical ROM.
What type of work, hobbies, or other regular activities do you do?	Repetitive motions that stress the knee and static postures that increase flexion of the knee may contribute to the client's condition.
Are you taking any prescribed medications or herbal or other supplements?	Medication of all types may contribute to symptoms or have contraindications or cautions.
Have you had a corticosteroid or analgesic injection in the past 2 weeks? Where?	Local massage is contraindicated.
Have you taken a pain reliever or muscle relaxant within the past 4 hours?	The client may not be able to judge your pressure.
Have you taken anti-inflammatory medication within the past 4 hours?	Deep friction may initiate an inflammatory process and should not be performed if the client has recently taken anti-inflammatory medication.

Postural Assessment

Allow the client to walk and enter the room ahead of you while you assess their posture and movements. Look for imbalances or patterns of compensation for deviations common with patellofemoral syndrome. Watch as the client climbs steps, and look for reduced mobility in the knee or whether the client is favoring one side. Assess for joint instability, limping, rotation of the femur or tibia, or hyper- or hypolordosis. Have the client sit to fill out the assessment form and watch to see if they lower into the chair cautiously or shifts around to find a comfortable position for the knee. Watch also as the client stands up to see if they can stand without assistance or whether they lift out of the chair using the arms or by leaning on a stable surface.

When assessing the standing posture, be sure that the client stands comfortably. If they try to stand in the anatomic position, you will not get an accurate assessment of their posture in daily life. If the patella is tracking laterally, you may notice adduction of the hips, valgus of the knee, increased Q angle, or eversion of the ankle. If the patella is tracking medially, you may notice rotation of the femur and tibia, which appears as lateral rotation of the feet. Other anomalies may include patella alta or patella baja, hyper- or hypoextension of the knees, swelling around the patella, and pes planus or pes cavus.

Figure 3 compares a healthy posture to a posture affected by patellofemoral syndrome due to lateral tracking of the patella.

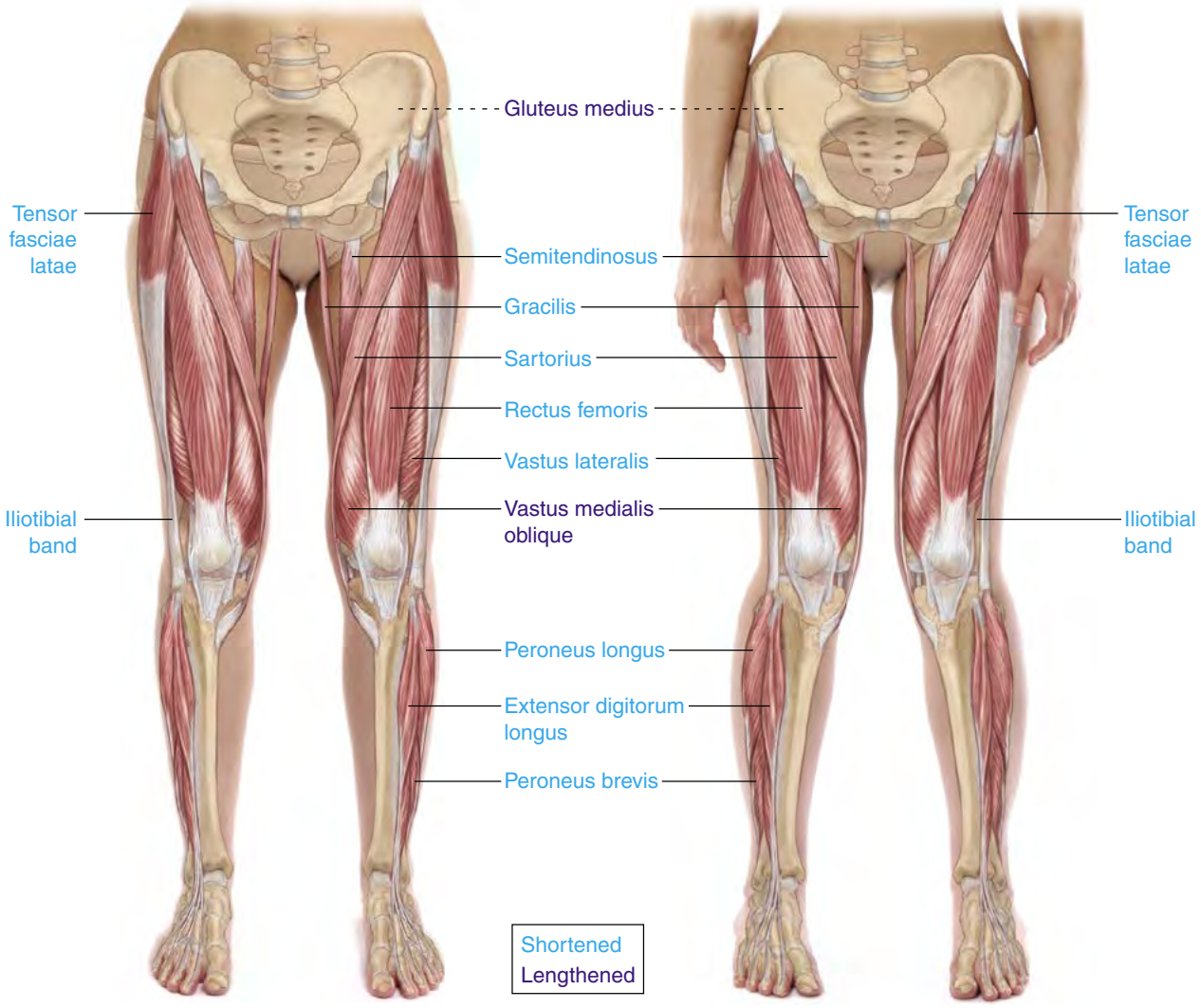


Figure 10-3 Postural assessment comparison. Compare the postures in these images. In the figure on the right, note the angle and rotation of the femur and tibia and the orientation of the ankle and the foot.

ROM Assessment

Test the ROMs of the knee involving muscles as both agonists and antagonists. Since it allows the client to control the amount of movement and stay within a pain-free range, only active ROM should be used in the acute stage of injury to prevent undue pain or re-injury. Box 1 presents the average active ROM results for the joints involved in patellofemoral syndrome.

Box 10-1: Average Active ROM for Joints Involved in Patellofemoral Syndrome

Hip

Flexion 110–120˚
- Rectus femoris
- Gluteus medius (anterior fibers)
- Tensor fasciae latae
- Sartorius
- Psoas major
- Iliacus
- Gluteus minimus
- Adductor magnus
- Adductor longus
- Adductor brevis

Extension 10–15˚
- Biceps femoris
- Semitendinosus
- Semimembranosus
- Gluteus maximus
- Gluteus medius (posterior fibers)
- Adductor magnus (posterior fibers)

Lateral Rotation 40–60˚
- Biceps femoris
- Gluteus maximus
- Gluteus medius (posterior fibers)
- Sartorius
- Piriformis
- Quadratus femoris
- Obturator internus
- Obturator externus
- Gemellus superior
- Gemellus inferior
- Psoas major
- Iliacus

Medial Rotation 30–40˚
- Semitendinosus
- Semimembranosus
- Gluteus medius (anterior fibers)
- Adductor magnus
- Adductor longus
- Adductor brevis
- Gracilis
- Pectineus
- Tensor fasciae latae

Hip (continued)

Abduction 30–50˚
- Gluteus maximus
- Gluteus medius
- Gluteus minimus
- Tensor fasciae latae
- Sartorius
- Piriformis (with flexed hip)

Adduction 30˚
- Adductor magnus
- Adductor longus
- Adductor brevis
- Pectineus
- Gracilis
- Psoas major
- Iliacus
- Gluteus maximus (low fibers)

Knee

Flexion 120–150˚
- Biceps femoris
- Semitendinosus
- Semimembranosus
- Gracilis
- Sartorius
- Gastrocnemius
- Popliteus
- Plantaris

Extension 0–15˚
- Rectus femoris
- Vastus lateralis
- Vastus medialis
- Vastus intermedius

Medial Rotation (when flexed) 20–30˚
- Semitendinosus
- Semimembranosus
- Gracilis
- Sartorius
- Popliteus

Lateral Rotation (when flexed) 30–40˚
- Biceps femoris

Ankle

Dorsiflexion 20˚
- Tibialis anterior
- Extensor digitorum longus
- Extensor hallucis longus

Plantar Flexion 50˚
- Gastrocnemius
- Soleus
- Tibialis posterior
- Peroneus longus
- Peroneus brevis
- Flexor digitorum longus
- Flexor hallucis longus
- Plantaris

Inversion 45–60˚
- Tibialis anterior
- Tibialis posterior
- Flexor digitorum longus
- Flexor hallucis longus
- Extensor hallucis longus

Eversion 15–30˚
- Peroneus longus
- Peroneus brevis
- Extensor digitorum longus

Active ROM

Compare your assessment of the client's active ROM to the values in Box 1. Pain and other symptoms may not be reproduced during active ROM assessment because the client may limit movement to a symptom-free range.

- **Active extension of the knee** may be restricted and cause pain when weak quadriceps and shortened hamstrings limit movement and when improper patellar tracking increases bone to bone contact. Grinding or clicking may be heard or felt by the client. Active extension of the knee may also

reveal lateral tracking of the patella when the rectus femoris and vastus lateralis contract with greater force than the vastus medialis.

- **Active abduction of the hip** may be restricted if medial rotation of the femur and knee valgus are present.
- **Active dorsiflexion of the ankle** may be restricted if the plantar flexors of the ankle are short and tight.

Passive ROM

Compare the client's P ROM on one side to the other when applicable. Note and compare the end feel for each range.

- **Passive flexion and extension of the knee** may reveal crepitus.
- **Passive extension of the knee** may reveal lateral tracking of the patella when the lateral retinaculum is tight or medial tracking if the medial retinaculum is tight.

Resisted ROM

Use resisted tests to assess the strength of the muscles that cross the knee. Compare the strength of the affected side to the unaffected side.

- **Resisted extension of the knee** may reveal weakness in the quadriceps and cause pain in the anterior knee.
- **Resisted flexion of the knee** may cause pain in the anterior knee.
- **Resisted abduction of the hip** may reveal weakness in the gluteal muscles.

Special Tests

The following special tests can help you to determine which structures are contributing to pain and when a client should be evaluated by a medical professional using X-ray or other tools, which may reveal conditions that are contraindications or require special considerations when planning treatment with massage.

The patellar glide test is used to assess the medial and lateral mobility of the patella (Fig. 4). This test may also reveal crepitus.

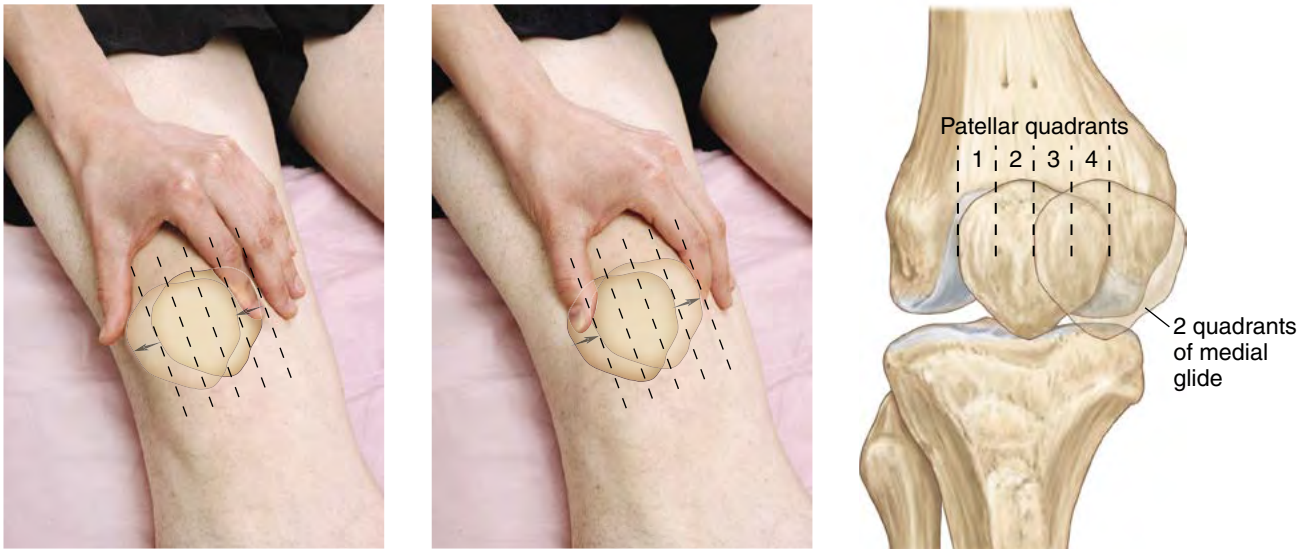


Figure 10-4 Patellar Glide Test.

1. The client should be supine with a bolster under the knees and the quadriceps relaxed.
2. Place your thumb on one side of the patella and one or two fingers on the other side.
3. Slowly and gently glide the patella laterally and medially to assess its mobility. Ideally, the patella should move a distance equal to approximately half of its width in either direction.
4. Limited medial glide suggests that lateral structures are restricting movement. Limited lateral glide suggests that medial structures are restricting movement.

The vastus medialis coordination test is intended to isolate and assess the function of vastus medialis during extension of the knee (Fig. 5).

1. The client is supine with the knees extended and the quadriceps relaxed.
2. Place your fist under the distal thigh, superior to the affected knee.
3. Ask the client to slowly extend the knee without moving other joints while you assess the coordination of that action.
4. If you feel the client pushing the thigh into your fist or pulling away from your fist or if they flex the hip to raise the leg, ask them to perform the action again by extending only the knee. You may also be able to see the orientation of the teardrop-shaped vastus medialis.
5. The test is considered positive for vastus medialis oblique dysfunction if the client has difficulty extending the knee or if they recruit muscles other than the quadriceps to perform this action.

Figure 10-5 Vastus medialis coordination test. Test the functioning of the vastus medialis with resisted extension.

Palpation Assessment

Dysfunction in any joint from the sacroiliac to the metatarsals may cause or result from patellofemoral dysfunction. Because contributing factors may vary widely, it is essential to assess the tissues of each individual client from the ilium to the toes. It should not be surprising to find minor or even major differences in the way the tissues respond to this dysfunction.

Assess the knee for atypical temperature, color, and texture. You may find inflammation, adhesions, and tenderness around the patella. If the patella is tracking laterally, you may find the lateral retinaculum, iliotibial band, vastus lateralis, rectus femoris, and tensor fasciae latae tight and adhered; they may contain trigger points. The vastus medialis oblique may be hypotonic, and the semitendinosus, gracilis, and sartorius—muscles that blend into the pes anserinus tendon—may be dense and adhered with trigger points. Crepitus, fibrotic tissue, or a plica cord may be palpated at the medial knee. The hamstrings may feel tight and dense due to flexion contracture. Depending on the biomechanical factors involved, the adductors may be dense and adhered and the abductors taut or weak.

The gastrocnemius may also be tight due to flexion contracture at the knee. If eversion of the ankles is a factor, the peroneus longus and brevis and the extensor digitorum longus may be short and tight. These two factors may also play a role in developing plantar fasciitis, in which case the plantar flexors may be short and tight, and the tissues of the plantar surface of the foot may be thick, dense, and tender. Plantar fasciitis is covered in more detail in the next chapter. If the client has a long history of knee pain or injury or has had surgery, you may find scar tissue and adhesions in the affected areas.

Trigger points that refer pain into the anterior knee may be found in the sartorius, rectus femoris, vastus medialis, vastus lateralis, adductor brevis, and adductor longus. See Figure 6 for common trigger points with referrals into the anterior knee.

Figure 10-6 Common trigger points and referral. Common trigger points associated with patellofemoral syndrome and their referral patterns.

CONDITION SPECIFIC MASSAGE

Because the causes of knee pain vary widely, the exact cause can be difficult to pinpoint, and more than one of these conditions may coexist. Systemic conditions that involve cautions or contraindications for massage may be the underlying cause of knee pain. If you feel uncertain that symptoms are caused by improper tracking of the patella or any of the soft tissue dysfunctions listed above, refer the client for medical assessment by a health care provider prior to treatment with massage.

It is essential for the treatment to be relaxing. You are not likely to eliminate the symptoms associated with patellofemoral syndrome or any of the coexisting conditions in a single treatment. Do not attempt to do so by treating aggressively. Be sure to ask your client to let you know if the amount of pressure you are applying keeps them from fully relaxing. If the client responds by tensing muscles or has a facial expression that looks distressed, reduce your pressure. Remember that you are working on tissue that is compromised. Ask the client to let you know if any part of your treatment reproduces symptoms, and always work within their tolerance. Deep palpation of a trigger point may cause pain at the upper end of the client's tolerance. Explain this to your client, describe a pain scale with a level of pain that should not be exceeded, and ask them to breathe deeply during the application of the technique. As the trigger point is deactivated, the referral pain will also diminish. Common trigger points and their referral patterns are shown in Figure 6.

The following suggestions are for treating the more common presentation of patellofemoral syndrome, caused primarily by improper lateral tracking of the patella. If the client has an acute injury, the protocol is PRICE (protection, rest, ice, compression, and elevation). You may work conservatively proximal or distal to the site, but avoid the area of injury until the subacute or chronic stage.

Treatment Goals:

- Begin in the supine position with the knees bolstered.

- If you notice swelling, apply superficial draining strokes toward the nearest lymph nodes.

- If swelling is minor or absent, apply moist heat to the anterolateral thigh above the knee on the affected side. Do not use heat if swelling is significant.


- Use your initial warming strokes to increase superficial circulation, soften tissues, and to assess the tissues from the ASIS down to the feet. You should be able to minimally assess tissues of the thigh, leg, and foot, which may help you to determine where to focus the time remaining after treating the knee.

- Before applying emollient, assess for and treat myofascial restrictions in the thigh. You may find restrictions along the length of the iliotibial band, in the lateral quadriceps, and at the medial thigh and knee.


- Treat the tissues of the thigh generally to reduce tension and to continue reducing adhesions.


- Once the superficial tissues are pliable enough to allow for deeper work, lengthen tissues that are short and tight, and reduce tension in tissues that are taut. These may include the rectus femoris, vastus lateralis, tensor fasciae latae, iliotibial band, gracilis, sartorius, semitendinosus, and the adductors.

- Treat any trigger points that are found.


- Assess the tissue surrounding the patella and knee joint for crepitus, adhesions, and fibrous tissues. Tissues affected may include the medial and lateral retinacula of the knee, the pes anserine tendon, the quadriceps tendon, the patellar tendon, and the iliotibial band. Use small, focused strokes to release these tissues. If the structures are short and tight, follow this by long strokes in the direction of each muscle's fibers to restore length and tone. Take your time with this step, and treat the area thoroughly within the client's tolerance.

- If you found the adductors and medial hamstrings to be short and tight, stretch them by passively abducting the hip. Perform PIR, if necessary, to relax and lengthen these muscles if a passive stretch is insufficient.

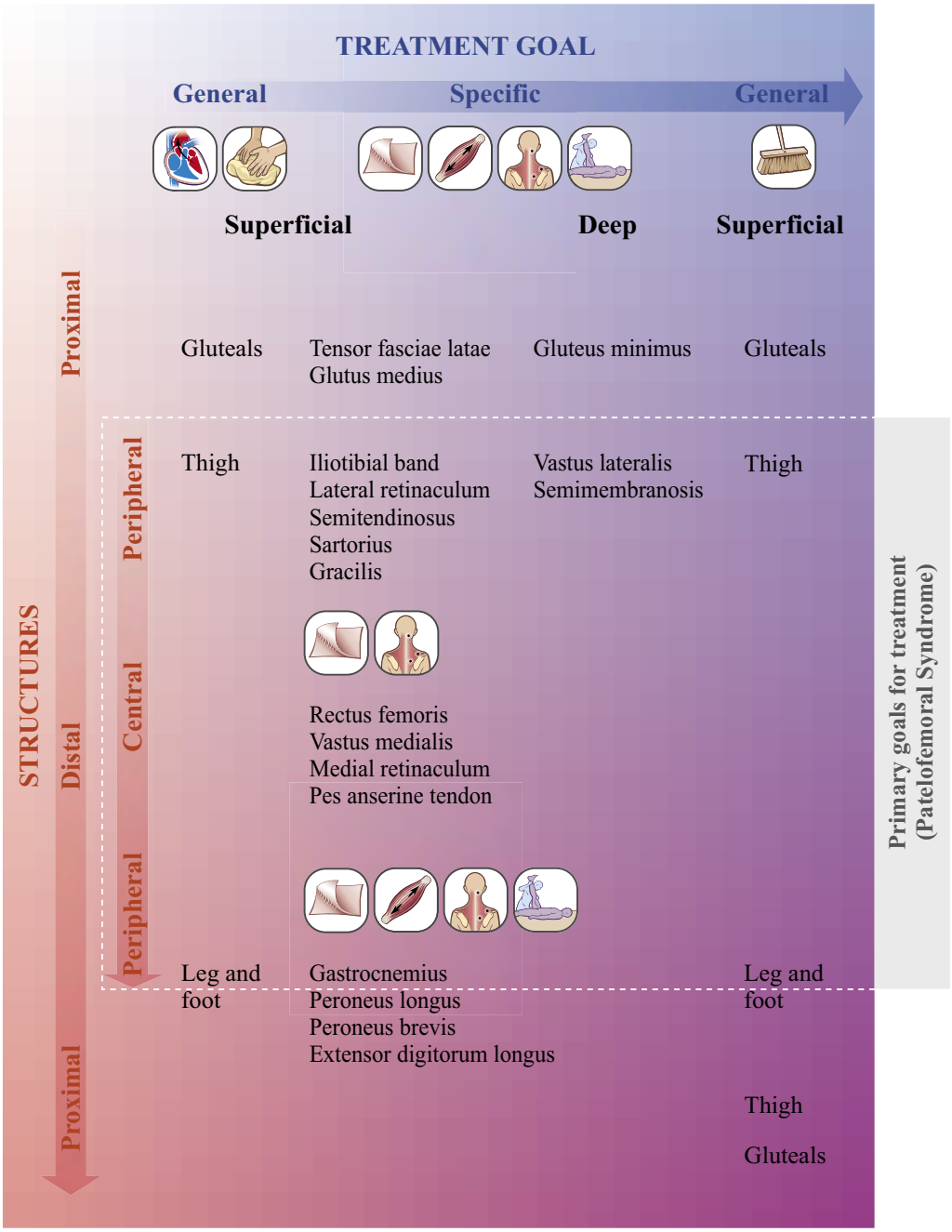

- If eversion is a contributing factor, assess and treat the peroneal muscles and extensor digitorum longus for adhesions, increased tone, and trigger points.

- Use clearing strokes to the entire lower extremity to increase venous return.

- Turn the client prone with a bolster under the ankles. Stretch the lateral quadriceps by bringing the heel toward the buttocks and gently pulling the leg toward you. Use PIR to encourage lengthening if you note resistance.


- If time permits, assess and treat the gluteal muscles, hamstrings, and plantar flexors for adhesions, hypertonicity, and trigger points if found.

- Use clearing strokes to the entire lower extremity to increase venous return.



CLIENT SELF-CARE

A client with patellofemoral pain may benefit from wearing a knee brace during activity, in particular if their activities include sports, repetitive actions, or weight-bearing motions of the knee such as squatting and lifting heavy objects. If the client wears a brace, recommend that they remove the brace during periods of inactivity to avoid reduced circulation to the area if the health care provider agrees. Clients with pes planus or eversion of the ankle may benefit from corrective arch support. Refer the client to a podiatrist for an assessment and fitting for corrective arch support.

The following are intended as general recommendations for stretching and strengthening muscles involved in the client's condition. The objective is to create distance between the attachment sites of muscles that have shortened and to perform repetitions of movements that decrease the distance between the attachments of

muscles that have weakened. If you have had no training in remedial exercises and do not feel that you have a functional understanding of stretching and strengthening, refer the client to a professional with training in this area.

Clients often neglect self-care because their daily lives are busy. Encourage them to follow these guidelines:

- Instruct the client to perform self-care throughout the day, such as while taking a phone call, reading e-mail, washing the dishes, or watching television instead of setting aside extra time. When performing self-care while standing, ask the client to notice if they are shifting weight to one leg, if the knees are close together, and if the femur is medially rotated. If so, instruct the client to focus on distributing weight evenly to both legs and to keep the toes pointed forward within their comfort level.
- Encourage your client to take regular breaks from stationary postures or repetitive actions. If the client's daily activities include hours of sitting, suggest moving for at least a few minutes every hour. If the client's daily activities require repetitive actions affecting the knee, suggest resting for at least a few minutes every hour.
- Demonstrate gentle self-massage of the tissues surrounding the knee to keep adhesions and hypertonicity at bay between treatments.
- Demonstrate all strengthening exercises and stretches to your client and have them perform these in your presence before leaving to ensure that they are performing them properly and will not cause harm when practicing alone. Stretches should be held for 15–30 seconds and performed frequently throughout the day within the client's limits. The client should not force the stretch or bounce. Stretching should be slow, gentle, and steady, trying to keep every other joint as relaxed as possible.
- Stretching and strengthening exercises should be recommended according to your findings in ROM testing and palpation. Because patellofemoral syndrome may present differently with each client, self-care should be tailored to specific needs.

Figure 10-7 Stretch the lateral structures of the leg.

Figure 10-8 Stretch the hamstrings and plantar flexors while strengthening the quadriceps.

Stretching

To stretch the lateral structures that may contribute to drawing the patella laterally, instruct the client to stand at an arm's length from a wall with the affected side toward the wall. Rest one hand on the wall for support, and with the feet together, laterally flex the trunk away from the wall and hold for 15–30 seconds (Fig. 7). Do not perform this stretch if it increases pressure on the medial knee. If you found the gluteus medius weak or stretched, instruct the client to adjust their posture in this stretch until it is felt primarily in the lateral leg instead of in the gluteal muscles.

To stretch the hamstrings and plantar flexors while seated, instruct the client to sit comfortably with the back supported, and then extend the knees and dorsiflex the ankles and hold for 15–30 seconds or as long as is comfortable (Fig. 8). This action also helps to strengthen the quadriceps. Repeat this action a few times, and then get up and walk around to mobilize the knee.

If eversion contributes, instruct the client to simultaneously stretch the evertors and strengthen the invertors by actively inverting the ankle fully and holding for as long as is comfortable. Repeat this action a few times, and then get up and walk around to mobilize the ankle.

Strengthening

While it is difficult to isolate the vastus medialis oblique from the other quadriceps, it is important to restore its strength and tone so that it can antagonize lateral tracking of the patella. The seated hamstring stretch described above also strengthens the quadriceps. Repeating the steps of the vastus medialis coordination test (Fig 5) with a rolled towel or other bolster under the thigh just above the knee will also strengthen the vastus medialis.

SUGGESTIONS FOR FURTHER TREATMENT

Ideally, a client with patellofemoral syndrome will have treatments twice a week until the client can perform activities of daily living with minimal or no pain for at least 4 days. Once this is achieved, reduce frequency to once per week until symptoms are absent for at least 7 days. When the client reports that they have been pain-free for more than 7 days, treatment can be reduced to twice per month. If the client is pain-free for 3 or more consecutive weeks, they can then schedule once per month or as necessary. If the client's symptoms are localized and other postural deviations are minimal, half-hour treatments may be sufficient to effect a change in patellofemoral function. In the treatment of patellofemoral syndrome that is muscular in nature, there should be some improvement with each session. If this is not happening, consider the following possibilities:

- There is too much time between treatments. It is always best to give the newly treated tissues 24–48 hours to adapt, but if too much time passes between treatments in the beginning, the client's activities of daily living may reverse any progress.
- The client is not adjusting activities of daily living or is not keeping up with self-care. As much as we want to fix the problem, we cannot force a client to make the adjustments we suggest. Explain the importance of the client's participation in the healing process, and encourage the client to follow your recommendations, but be careful not to judge or reprimand a client who does not.
- The condition is advanced or involves other musculoskeletal complications that are beyond your basic training. Refer this client to a massage therapist with advanced clinical massage training. Continuing to treat a client whose case is beyond your training could turn the client away from massage therapy altogether and hinder healing.
- The client has an undiagnosed, underlying condition. Discontinue treatment until the client sees a health care provider for a medical assessment.

If you are not treating the client in a clinical setting or private practice, you may not be able to take this client through the full program of healing. Still, if you can bring some relief in just one treatment, it may encourage the client to discuss this change with their health care provider and seek manual therapy rather than more aggressive treatment options. If the client agrees to return for regular treatments, their symptoms are likely to change each time, so it is important to perform an assessment before each session. Once you have released superficial tissues in general areas, you may be able to focus more of your treatment on deeper tissues in a specific area. Likewise, once you have treated the structures specific to patellofemoral syndrome, you may be able to pay closer attention to compensating structures and coexisting conditions.

Professional Growth

Case Study

Ronja is a 64-year-old, married female. She is a retired accountant. Ronja and her husband moved from suburban Chicago to San Francisco following their retirement last year. Over the past 2 months she has had knee pain, which is becoming worse. Currently, the pain makes it difficult for her to walk the hills of San Francisco to run her errands.

SUBJECTIVE

Ronja complained of knee pain that began approximately 2 months ago and has been increasing gradually. She feels aches, sometimes throughout the day, in both knees and feels pain around her right kneecap and on the inside of her knee when she walks. The pain keeps her from performing some activities on some days. She moved from a suburban setting where she worked sitting at a desk all day and had to drive everywhere, because everything was far from her home. She and her husband made a complete lifestyle change that included moving to a more natural environment where locally grown foods are readily available, and they could walk or ride a bike instead of driving. It was difficult at first for her to adjust to the increased activity, but she did not have any pain until recently. Her physician diagnosed chondromalacia and said that she would eventually need knee replacement surgery. He said that while nothing showed up on an MRI, it is probably in the early stages and will show up later. He gave her a prescription for physical therapy. She was referred by a friend who was treated at this clinic and experienced a full recovery from similar symptoms.

OBJECTIVE

Ronja appears very healthy and vibrant and looks many years younger than her age. She climbed the stairs very slowly, mainly relying on the left leg to lift her weight. She also stood up from a seated position very cautiously but without leaning on the table or chair for support.

Postural assessment revealed increased lordotic curve with anterior pelvic tilt, slight lateral rotation of the hips bilaterally, flexion of the knees bilaterally, and ankle eversion bilaterally. The four lateral toes of the right foot are hyperextended. The Q angle appears within normal range. Medial patellar glide is reduced. ROM testing resulted in reduced active extension of the knees bilaterally, which is possibly a protective measure. The client felt pain in the medial knee with resisted extension of the knee and resisted adduction of the hip. During passive extension of the right knee, Ronja tensed up at the end range. Crepitus was noted during extension and flexion of the right knee. There was weak abduction of the right hip and minimal active inversion of the ankles. There was only slightly greater range with passive inversion.

Palpation revealed tension in rectus femoris which is adhered to a hypertonic vastus lateralis and a dense, fibrous iliotibial band on the right. Fascial restrictions along the lateral right thigh from ASIS to tibiofibular joint. The medial aspect of the patellofemoral joint was tender to the touch with considerable crepitus and possible plica cord. The vastus medialis feels fibrous and hypotonic. The semitendinosus, sartorius, and gracilis, along with the pes anserine tendons, are taut and tender with adhesions at the distal fibers. The hamstrings feel dense and adhered only at the distal, medial fibers. The peroneals and extensor digitorum longus are short, tight, and adhered. The ankle invertors are taut and weak.

Signs and symptoms suggest patellofemoral syndrome with mild hyperlordosis.

ACTION

Treatment today focused on reducing knee pain. If the client agrees, future treatment will include restoring proper knee function, pelvic tilt, orientation of the femur and the tibia, and ankle function.

On the right thigh, I performed myofascial release from the ASIS to the tibiofibular joint. I used cross-fiber friction on the iliotibial band. I then used petrissage followed by muscle stripping to the rectus femoris, vastus intermedius and vastus lateralis, and IT band. A trigger point was found at the superior fibers of the rectus femoris that referred into the anterior knee. Two rounds of compressions reduced referral pain from level 7 to 2. I applied cross-fiber strokes to the medial knee to release metabolites and reduce crepitus followed by clearing strokes toward the inguinal lymph nodes. I applied general kneading to the medial thigh. I used cross-fiber strokes from the pes anserine along the path of the sartorius and again along the path of the gracilis and the medial hamstrings to separate the fibers of the muscles of the medial thigh, followed by long gliding strokes. I used muscle stripping to lengthen the sartorius and medial hamstrings and performed a stretch to the medial hamstrings. I applied myofascial release, superficial cross-fiber strokes, and muscle stripping to reduce adhesions and lengthen ankle evertors.

I used similar, although less aggressive, treatment to the left thigh and leg. I also applied general deep tissue techniques to the low back, gluteals, calves, and feet.

Following treatment, the client stated feeling looser and less protective with steps. Ronja descended the stairs with less caution, although she did use the handrail.

PLAN

I demonstrated a hamstring stretch with knee extension and hip flexor stretches with lunges. I recommended speaking with a podiatrist about shoes with good arch support or being fitted for orthotics to reduce eversion. I demonstrated strengthening for ankle invertors and vastus medialis and emphasized the importance of limiting exercises to a pain-free range. I suggested slowly reintroducing activities that had previously resulted in pain.

I explained that reducing symptoms at the knee alone is manageable with half-hour sessions but that biomechanical factors at the hip and ankle likely contribute to her pain and a more complete recovery would best be managed with 1-hour sessions. Ronja has agreed to 1-hour treatments twice a week until symptoms are absent for at least 4 consecutive days with reassessment at that time.

CRITICAL THINKING EXERCISES

1. 1. In general, the most common presentation of patellofemoral syndrome emerges when the lateral structures that move and stabilize the knee in extension are stronger than the medial structures. Create a SOAP chart with a history, assessment, and treatment plan that describes a case of patellofemoral syndrome due to excessive medial tracking of the patella. This client likely presents with pain and tenderness at the lateral knee, weakening of structures that affect lateral tracking, and tension in structures that affect medial tracking. Treatment goals should include lengthening shortened tissues, strengthening weak muscles, and restoring proper neuromuscular function.
2. 2. Develop a 10-minute stretching and strengthening routine for a client, covering all of the muscles involved in patellofemoral syndrome. Use Box 10-1 and Figure 10-4 as a guide. Remember that a stretch increases the distance between the origin and insertion of a muscle and is important for those muscles that are shortened while strengthening is performed by actively bringing the origin and insertion closer together and is important for the antagonists of shortened muscles. Describe each step of

the routine in enough detail that the client can refer to these descriptions in your absence and perform them without harm.

3. 3. A client calls to schedule a massage for knee pain. He states that he hears crunching and clicking in his knee when he stands up and sometimes when he walks. He explains that he has sprained the ankle of the affected leg twice and the ankle of the opposite leg once. He has also had an episode of myositis ossificans to the tibialis anterior after being kicked during a soccer game. Discuss the possible relationship between the injuries and patellofemoral syndrome. What questions would you ask this client? Are there questions that you need to ask his health care provider? What special considerations would you need to include in your treatment plan both for contributing factors and for contraindications?
4. Conduct a short literature review to explain the relationship between symptoms suggesting patellofemoral syndrome and the following:
    - Pes cavus
    - Arthritis
    - Insufficient anterior prominence of the lateral femoral condyle
    - Depth of the patellar groove
    - Patellar taping

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