CHAPTER 3

POSTURAL AND MUSCULAR ADAPTATIONS RELATED TO PREGNANCY

LEARNING OBJECTIVES

After reading this chapter, you should be able to:

- Describe the effects of weight gain, hormones, self-esteem, and pre-pregnancy muscle tone on posture.
- Describe postural and muscular stresses and adaptations during pregnancy and their relation to common complaints during pregnancy.
- How to assess posture and help a woman readjust her posture during pregnancy to decrease some of her strains and discomforts.
- Understand the need for teaching clients or partners tools for self-care as a way to address certain pregnancy discomforts.
- Describe symptoms of strained uterine ligaments and their similarity to other muscular complaints.
- Explain under what conditions a separation of the rectus muscle may occur during pregnancy, and describe the symptoms, assessment, and prevention or correction of a separation.

In this chapter, we will examine the effects of weight gain, hormones, self-esteem, and pre-pregnancy muscle tone on posture and the changes that develop during pregnancy relative to these effects. We will look at how postural adaptations and muscular stresses can cause back and neck pain, psoas and uterine ligament spasms, headaches, and leg cramps. Next, we explore ways to improve a woman's experience of pregnancy with postural assessment and adjustment, as well as with assessment of the rectus abdominus. You will learn about areas of the body that are especially stressed as well as teaching tools to share with your clients that can address muscular areas that need strengthening. By combining this knowledge with skilled bodywork, as discussed later in the book, along with client education, you will be able to effectively address specific pregnancy discomforts.

POSTURAL ASSESSMENTS AND CORRECTIONS DURING PREGNANCY

Within the 9-month gestational period, a woman normally gains between 20 to 35 pounds of extra weight. This weight is distributed among the placenta, baby, uterus, additional breast tissue, and extra fluids and blood (Box 3.1). While a mother may flourish with this extra blood flow, increased oxygen intake, hormonal boosts, and the energizing enjoyment of a secret world developing between herself and her growing child, her musculoskeletal structures are making adjustments to accommodate the extra load. As the muscles adjust, a woman's posture must shift as well, bringing with it new or unusual aches and pains.

These adjustments become more dramatic by the latter part of pregnancy, when a woman is gaining nearly 1 pound per week, most of it on the anterior side of her body. The muscles most affected by this

BOX 3.1 | Weight Gain in Pregnancy

In a normal 9-month pregnancy, the average weight gain of 20 to 35 pounds is made up of the following:

- 4 to 7 pounds of fat and muscle
- 2 to 5 pounds of cellular fluids
- 2 to 4 pounds of blood and plasma
- 2 to 4 pounds extra breast weight
- 6 to 9 pounds of baby
- 2 pounds of uterus
- 1.5 to 2 pounds of amniotic fluid
- 2 pounds of placenta

gain include those that support the weight of the abdomen anteriorly, posteriorly, laterally, and from below. These muscles include the abdominals, iliopsoas, paraspinals, spinal erectors, adductors, lateral hip rotators, and the pelvic floor group. The muscles supporting the increasing weight and size of the growing, and soon-to-be lactating breasts, are also affected, including the rhomboids, pectoralis, subscapularis, scalenes, and levator scapula.

In response to the extra weight and anterior expansion of the belly, a woman's posture must change. As the abdomen stretches, the spine naturally compensates by developing more curvature in the lumbar area. This can cause low back pain due to compression of the lumbar nerve roots and strain to the deep lumbar and paraspinal muscles. As the abdominals stretch, the connective tissues of the thorax, shoulders, and throat area are also affected, pulled caudally with gravity, and causing strain to the spine as it attempts to support an erect posture. Excessive lumbar lordosis and consequent low back pain increase drastically as each muscular area supporting the pelvis responds to the rapid structural changes. As the pelvis tilts anteriorly, a typical stressful pregnancy posture might develop to compensate.

If a woman has weak musculature and pays little attention to her posture, she may develop a variety of discomforts or dysfunctions, including low back, shoulder, neck, and upper back pain, brachial plexus syndrome, leg cramps, diastasis recti, sacroiliac joint dysfunction, headaches, and shortness of breath. The client can often avoid these conditions by increasing postural awareness and correcting her posture as needed, along with receiving therapeutic massage and taking part in regular exercise to help diminish stresses as they occur. Box 3.2 outlines muscular influences on lumbar lordosis.

Contributing Factors to Poor Posture

The following factors have the strongest effects on posture during pregnancy.

Gravity

Gravity and the continual growth of the uterus and baby cause the forward and downward pull of the growing uterus, increasing lumbar lordosis and stressing the abdominals. Improved self-awareness about posture will help to avert the constant influences of gravity.

Hormones

Posture is also influenced by the effects of relaxin on connective tissue and ligamentous structures (see

BOX 3.2 | Muscular Relationships to Lumbar Lordosis

- A shortened psoas pulls on the anterior lumbar spine.
- The quadratus lumborum (QL) and erector spinae complex pull the sacrum and iliac crests up toward the thoracic spine.
- Shortening of the lumbar intervertebral muscles, such as the multifidi, decreases the spaces between the vertebrae, pulling them tighter and increasing lordosis.
- Rectus and transverse abdominus, in a constant stretch from the growing abdomen, become weaker, unable to fulfill their role of pulling the pelvis posteriorly and supporting the abdominal contents and back.
- The gluteal muscles help stabilize the pelvis and extend and medially rotate the hip. If these are weak, lumbar lordosis and lateral hip rotation increases.
- The hip flexors iliacus, tensor fasciae latae, sartorius, rectus femoris, and quadriceps—shorten as the pelvis rolls forward toward them.
- The hamstrings are in constant stretch, weakening and decreasing their ability to stabilize the pelvis posteriorly at the ischial tuberosity.

Chapter 2). While ligaments are critical for helping humans to stand comfortably erect, during pregnancy, women cannot depend on their newly lax ligaments to adequately support them. Muscles take on a more prominent role in stabilizing joints and, unlike ligaments, become fatigued, possibly leading to strains and spasms. Elastic or cloth **abdominal support binders** that wrap around the belly and support its weight during the later stages of pregnancy may be effective in mediating some of these hormonal effects.[1] Figure 3.1 shows one example of an abdominal support available for pregnant women. See Appendix B, Resources for the Practitioner, for sources of maternity abdominal supports.

Muscle Tone

Poor muscle tone greatly affects a woman's ability to hold herself erect during pregnancy. Imagine trying to maintain your normal daily activities while carrying 28 pounds of solid weight on your belly with a thin, stretchy fabric for support. The cloth would stretch in front, the weight would bear down, and the strain in your back would increase as your muscles attempted to hold the weight closer to the center of your body. As a massage therapist, you might encourage your client to strengthen the muscle groups that help to support this weight. These especially include the perineals, abdominals, psoas, hip extensors (gluteals), QL, lateral shoulder rotators (teres minor and infraspinatous), rhomboids, and spine extensors (erector spinae).

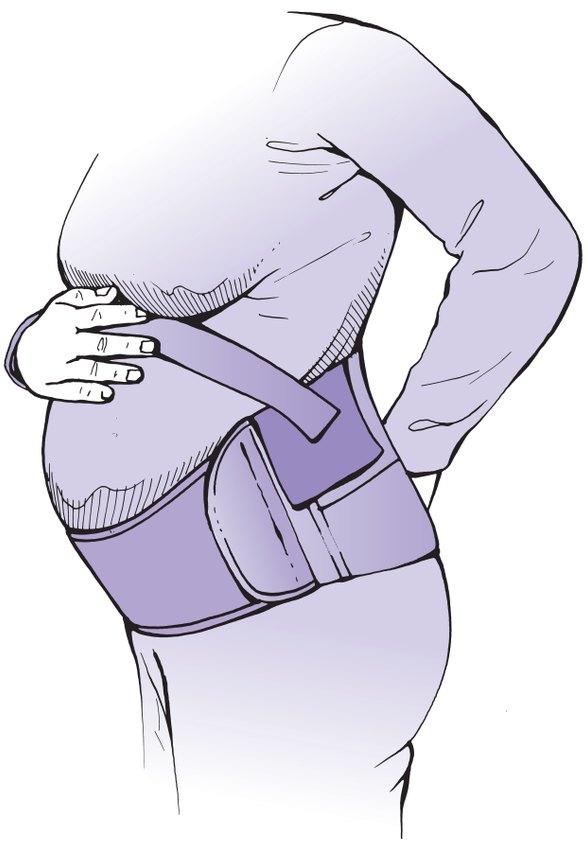

FIGURE 3.1 **Maternity abdominal support.**
These are often recommended for women with pendulous abdomens, or with complaints of sacroiliac, hip, and low back pain. There are numerous styles and sources for such supports.

Muscle Tension

Pain-producing posture can develop when weak primary muscles cannot support the structural changes of pregnancy; when this occurs, secondary muscle groups become shortened and strained in their effort to compensate for the lack of support from others. Pelvic stabilizing muscles that may need strengthening include the gluteals, hamstrings, and perineal groups, transverse abdominus, perineals, and the hip adductors. The QL, psoas, and lateral hip rotators are notoriously tight and often are a source of discomfort in pregnancy. A woman may develop a kyphotic-type posture in the upper back as the medial or internal shoulder rotators tighten, pulled forward by the anterior weight of the breasts. Stretching and lengthening these tight muscles can help to improve postural balance.

Size and Position of the Baby

Some babies rest close to the mother's spine, whereas others lie forward, making the mother's belly pendulous, with all the weight extended out in front of her. If the baby is exceptionally big, or if she is carrying multiple babies, the mother's belly may become quite large, necessitating subtle or dramatic shifts in her posture to find balance.

Self-Esteem

Esteem can be a strong or minimal influence, but a woman with low self-esteem may carry her new weight less efficiently than a woman who feels healthy and empowered. Providing massage visits that foster positive self-esteem will help your client more easily incorporate suggestions for improved posture.

Assessing Posture

Look at the photographs in Figure 3.2, which depict healthy posture (A) and posture that will inevitably cause discomfort (B). It is not uncommon to see various elements of Posture B in pregnancy, most often

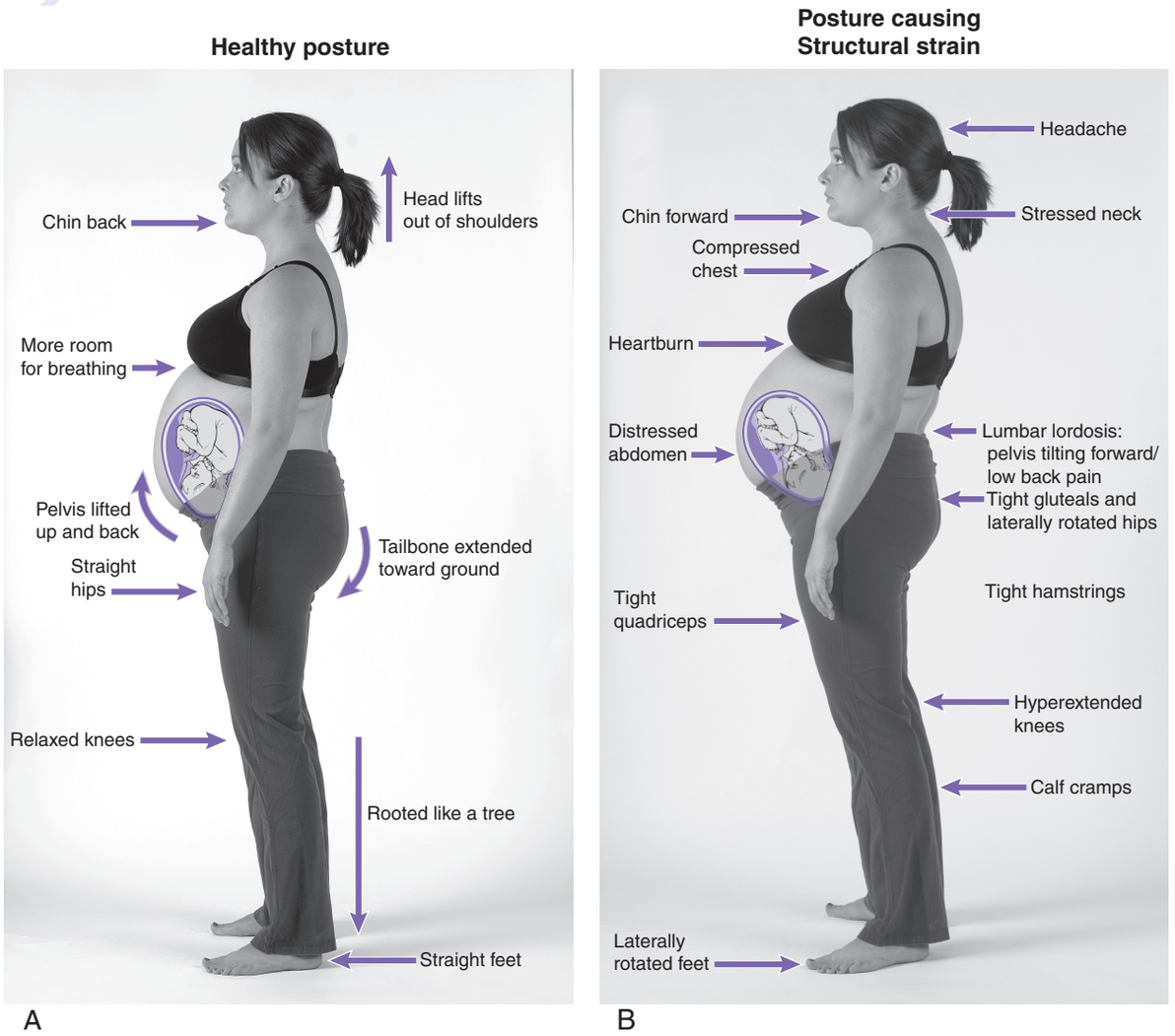

FIGURE 3.2 **Posture in pregnancy.**

(A) Healthy posture and (B) posture causing structural strain. Note in (B) slumped shoulders, jutting chin, hyper-extended knees, laterally rotated hips and feet, and compressed chest. Her symptoms may include the following: shortness of breath, heartburn, headache, neck strain, low back pain, and calf cramps.

due to the influence of gravity and lack of awareness regarding one's posture.

Helping your client to readjust her posture can improve her experience of pregnancy. It is easy to remind your client at each visit of the importance of standing tall. Here are some suggestions for assessing your client's stance:

1. Observe your client walking or standing: ask her to walk around the room, or just observe her as she walks into your office. Are her feet turned out, in the "pregnancy waddle"? Her lateral hip rotators are likely very tight. Are her shoulders hunched forward, pulled by the weight of the breasts? Is her back arched? Is she holding her belly up with her hands? Is her chin jutting forward in an effort to hold the head more erect? In what areas of the body do you think she will be feeling particularly stressed?
2. Try positioning yourself in her posture (or with the exaggerated Posture B in Figure 3.2) for 30 to 60 seconds, and note where you begin to feel discomfort. This will give you rapid evidence for where your client will be experiencing strain. Inevitably the hips, shoulders, neck, knees, and buttocks all begin to develop tension when the body is poorly positioned. In addition to the changes noted above, others occur. In response to extra lumbar lordosis, the knees hyperextend and lock,

compensating for the anterior pull of the belly and the posterior counter pull of the upper back. The psoas shortens and anteriorly tractions the lumbar spine. The tight erector spinae complex and QL pull up on the sacrum and iliac crests. The quadriceps and other hip flexors shorten, pulling down anteriorly on the pelvis. The minor stabilizing effect of the hamstrings and adductors decreases as they are stretched by the anterior pelvis. (Box 3.2).

Adjusting Posture

Keeping the pelvis in a neutral position and the low back lengthened requires conscious attention and exercise to maintain during pregnancy. Often, strengthening or stretching the muscles of support is necessary. The abdominal muscles must be strong enough to support the abdominal contents and keep the pelvis pulled up in front, and the psoas needs to be lengthened enough to prevent pulling down on the lumbar spine. Until this is achieved and can be maintained, help your client practice and develop the stance of solid, well-balanced posture in the following manner.

1. Show your client the illustration of optimal posture compared with that of stress-producing posture (Figure 3.2). Have her stand against a wall and flatten her low back against it. In this position, she can feel what it is like to have a straight back with her pelvis in posterior or neutral position.
2. Now have her stand away from the wall with her feet facing straight forward, hip-width apart. Ask her to relax her knees slightly out of a hyperextension and allow her sacrum and buttocks to drop slightly toward the ground. As she stands with feet apart and parallel, gently encourage her to envision her body naturally aligning itself.
3. Have her find a balance between her feet, by bringing her weight evenly between the heels and center of the sole of each foot.
4. Squeeze and hold the back of her heels, encouraging her to feel her feet grounded on the earth. Then run your hand from her sacrum up her spine to her head, suggesting that she imagine herself as a tree, rooted in the ground through her feet and reaching up to the sky through her spine, neck, and head. With this stroke up her body, ask her to inhale, as if she is bringing water up the tree trunk. Suggest that she loosen her knees, tuck her tailbone slightly to bring her pelvis more fully under her belly as support, lengthen her neck, drop her chin just slightly toward her chest, and relax her jaw, face, and shoulders. If she can imagine her pelvis as a basket holding her growing infant, she may be able to feel how to position herself, imagining that if the basket is tipped too far forward, the baby will fall out.
5. Place your thumb and forefingers under her occiput, holding the occipital ridge and steadying her head with your other hand on her forehead. Ask her to take in a deep breath and lengthen her spine as you lift slightly, applying a gentle traction under her head toward the sky (Figure 3.3). In yoga, this is

FIGURE 3.3 **Adjusting posture**
Lift from under the occiput, with another hand stabilizing on the forehead, encouraging the client to inhale deeply and allow her spine to lengthen.

similar to Mountain Pose, or Tadasana, which implies standing rooted and firm as a mountain and which brings clarity and fortitude to those who practice it.

6. Lift up from the occiput. Encourage her to lengthen her entire spine, rising from her hips and pelvis and again reminding her to lift toward the sky like a tree, or as if there were a cord extending from the earth up through her coccyx to the top of her head and pulling her upright. Encourage her shoulders to widen with a deep breath, allowing them to fall back as the chest expands and the breath flows into her chest and belly like an ocean tide. This practice will give her the sensate experience of length, strength, and ease. It will help her to realign herself, and to walk with this imagery impressed in her mind.
7. Continue holding and lifting under her occiput for several of her breaths as her spine extends from the sacrum to the neck. Allow her time to settle into this taller stance, noticing how that feels. She may be standing several inches taller than she was a moment ago. Of course, it is easy to be forgetful of one's posture and sink down again under the seductive lure of gravity! But with regular reminders of how to return to a tall and spacious posture, supported by massage that encourages opening and lengthening, a healthy posture can become a natural stance.

How the Partner Can Help

Postural Support

The client may ask the massage therapist to share postural awareness and adjustment methods with the client's partner, so that he or she can assist her in cultivating more habitual awareness of her posture. You may choose to invite the client's partner or support team to a session where you can teach them your way of observing, assessing, and correcting imbalanced stances. People who are often in proximity to the client will have frequent opportunities to observe how and when the client begins to alter her stance in ways that may cause her discomfort later. The support person benefits from this awareness as well, as it is not only during pregnancy that postural awareness is essential. Establishing a practice of assessing one's own posture at regular intervals each day can help him or her avoid personal injuries in times of stress, as well as in daily life.

Sitting Posture

Problems develop for pregnant women who work long hours sitting at a desk, as the flow of blood from

MASSAGE THERAPIST TIP

A Postural Checklist

The massage therapist can help adjust posture by using touch to bring the client's attention to her feet and up her spine, then tractioning cephalically under the occiput. The incorporation of visualizations and breath will assist this work. You might consider using some of the verbal cues included in this checklist to help the woman embody postural change.

- Leg alignment: Turn the feet straight forward, hip width apart, and relax the knees slightly.
- Grounding: Imagine tree roots extending and sinking into the earth from the tailbone and soles of the feet.
- Lengthening: Envision lengthening, like a tall tree, extending through the top and back of the head with branches reaching to the sky. Lengthen in the waist by allowing the upper torso to lift up from the hips.
- Breathing: Allow the breath to enter the chest like a rising ocean tide, deep and full, expanding the lower ribs and opening the sides and back of the thoracic cavity, then allowing the upper chest to fill with the final inflow of breath.
- Opening chest: Keep the shoulders broad, allowing them to fall naturally backward and relax downward.
- Lengthen the back of the neck: Lift the head up and away from the shoulders, feeling energy rise up from the earth-roots through the spine to the head, and envisioning the posture of one who feels strong, proud, or even regal.

the pelvis to the legs can be impeded. Positive posture can be practiced in the chair as well, remembering to lift the torso up out of the hips, and place the feet on a footrest so that the knees are at least at a 90-degree angle to the floor, and not dangling from the chair. This can help prevent the development of problems such as varicosities, pelvic congestion, hemorrhoids, edema, and leg cramps. Your client also may want to find a way to extend her legs frequently to relieve some of the congestion in her pelvic area.

MUSCULAR AREAS STRESSED BY PREGNANCY

As described earlier, specific muscle groups are particularly stressed during pregnancy. Minor muscular strains are not an uncommon experience during gestation. It may be useful to remind your client who is complaining of frequent muscular aches, that regular exercise can help decrease incidents of muscular discomfort, while having the additional benefits of cultivating a higher tolerance for pain during birth and generally improving birth outcomes.[2-5] Activities that are particularly beneficial during pregnancy for women beginning a new exercise regimen include low-impact or non–weight-bearing activities such as swimming, walking, biking, and yoga. Strengthening and stretching regularly also will help your client improve her posture.

Presented below are some of the most obvious muscles affected by pregnancy—including some at the core of postural support—and the consequences of the stress they endure: the uterus and its ligaments, perineals, abdominals, psoas, and QL. Most of these muscles can be addressed with massage during pregnancy, as well as with standard stretches and strengthening exercises.

Uterus

The uterine muscle undergoes perhaps the most dramatic adaptations to pregnancy, and its strained ligamentous support can sometimes cause a variety of discomforts. The uterus is a reproductive organ, but it is also the strongest muscle for its size in a woman's body. Before pregnancy, the uterus typically weighs about 2 ounces. By the end of a full-term pregnancy, the uterus alone, minus its contents, typically weighs about 2 pounds. It has increased its volume capacity by 1000 to 4000 times and is four to six times larger than it was before the pregnancy. The actual number of uterine muscle cells increases through the first trimester of pregnancy; then, the cells begin to enlarge and, eventually, in the second trimester, stretch until they are 10 times longer than their original size.

Uterine Ligaments

Six primary ligaments, along with the endopelvic fascia and other connective tissue, support and suspend the uterus. During pregnancy, any of these ligaments can spasm and refer pain to areas in the back, legs, or groin (Figure 3.4).

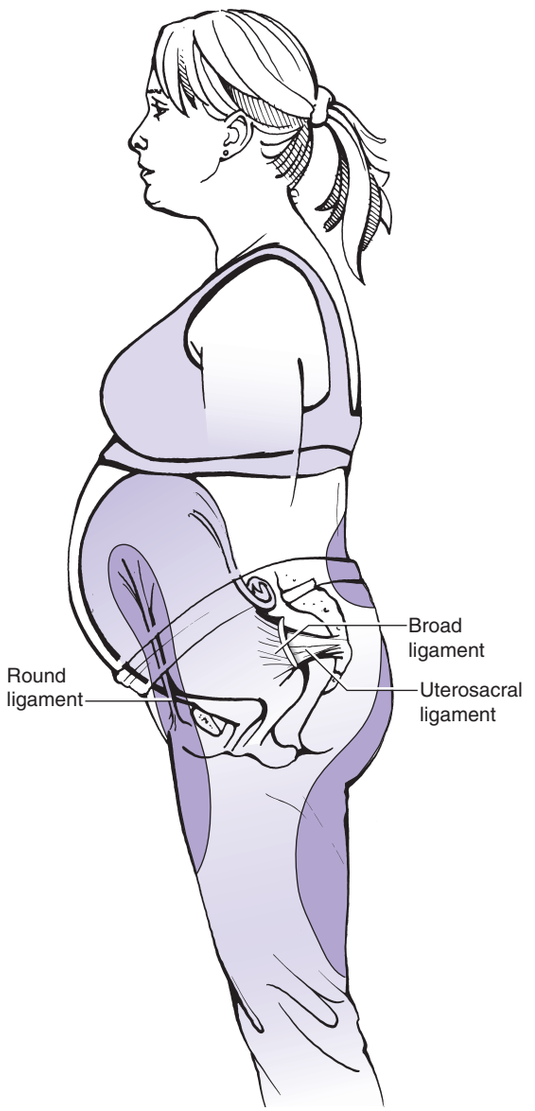

FIGURE 3.4 Uterine ligaments and areas of referred pain.

The round ligament spasm will pull in the pelvic area and can cause pain in the lower pelvis, anterior leg, or most commonly, sharp pain in the groin. The broad ligament attaches in the wide area of the pelvis and causes discomfort in the low back and buttocks when in spasm. The uterosacral ligament attaches from the posterior uterus to the sacrum and, when pulled, causes pain in the sacrum, sciatic-like pain down the back of the leg, sacroiliac joint pain, and diffuse low back pain.

The two **round ligaments** are mostly a continuation of the uterine smooth muscle and originate on the anterior surface of the uterus below the fallopian tubes. They traverse the broad ligament to the lateral abdominal wall. There they pass through the inguinal canal to attach to the inner aspect of the labia majora of the vagina.

The two **uterosacral ligaments** arise from the posterior uterus and cervix, just inferior to the uterocervical juncture. They attach to the periostium of the anterior mid-sacrum and near the sacroiliac joints.

The two **broad ligaments** spread out like a sheet from the lateral aspects of the uterus sinking into the fascia of the iliac fossa, the walls of the pelvic cavity, and into the connective tissue of the pelvic floor. Within the broad ligament are suspended the ovaries and round ligaments.

Bands of ligamentous tissue called the ligamentum transversalis colli, transverse cervical ligaments or **cardinal ligaments,** support the cervix and uterus. They arise from the lateral aspects of the cervix and traverse the broad ligament to insert into the anterior sacrum and lateral pelvic wall.

Referred Pain From Uterine Ligament Spasm

The uterine ligaments must stretch extensively during pregnancy, and it may be 6 months postdelivery before they, along with all the body's ligaments, return to their former nonpregnant state.[6,7] As they lengthen, these ligaments can spasm and cause discomfort that manifests as low back pain or pelvic discomfort. More severe ligament spasms may be misinterpreted as unrelated muscle spasm or as uterine contractions. Two of the most important actions a massage therapist can take to help prevent uterine ligament spasm are as follows:

1. Properly position a client on the massage table in a way that adequately supports the uterus.
2. Teach appropriate body mechanics for changing positions on the table, so that ligaments are not strained.

Uterine ligament spasms may be associated with the following types of discomfort (Figure 3.3):

- Round ligament spasm: Often experienced as pain in the lower pelvis, pain down the front of the leg, or sharp pain in the groin.
- Broad ligament spasm*:* Often experienced as discomfort in the low back and buttocks.
- Uterosacral ligament spasm*:* Experienced as pain in the sacrum, sciatic-like pain down the back of the leg, sacroiliac joint pain, or low back pain.

Bodywork Considerations Related to Uterine Ligaments

Below are some recommendations on how to alleviate pain from uterine ligament spasm in your clients:

- Educate your client to avoid sitting straight up from supine or lateral positions as instructed in Self Care Tip for the Mother: Preventing Abdominal and Uterine Ligament Strain (Figure 3.5).
- Support the client's growing belly with a small pillow or rolled towel when in the sidelying position to prevent strain on uterine ligaments (see "Positioning Techniques," Chapter 5).
- Suggest the use of an abdominal binder to help relieve backache caused by ligament pain (Figure 3.1).
- Teach your client to relieve round ligament pain by flexing the hip of the affected side and applying direct fingertip or palm pressure to the painful area near the groin.

Pelvic Floor

The **pelvic floor** or perineum refers to the muscles that hang like a hammock between the ischial tuberosity, the symphysis pubis, and the coccyx (Figure 3.6). These are generically and collectively known as the perineal muscles. The primary pelvic floor muscles include the group called the levator ani, the transverse perineal muscles, and the bulbospongiosus. They play a critical role in a woman's health, as they support the weight of the abdominal contents, including the organs and the baby-filled uterus. They also wrap like a figure eight around and control the three sphincters of the perineum: the urethra, the vagina, and the anus.

During birth, the perineal muscles must stretch and are sometimes cut or torn during delivery, weakening them. After this extreme stretching, or, as with any muscle, without exercise, the perineal muscles can lose their tone. Imagine a hammock, heavily loaded with weight, sagging toward the ground. The looser the hammock is woven and the heavier the load, the further it sags. Similarly, when the perineal muscles are untoned, the weight of the abdominal contents causes the muscles to sag. As many as one third to one half of all women in the United States experience problems caused by weak perineal muscles after age 55 and many of these pelvic floor dysfunctions develop after childbirth.[8,9] This includes symptoms of vague back and pelvic aches and heaviness, fatigue, vulvar varicosities and rectal hemorrhoids, urinary stress incontinence (urinating when coughing, sneezing, laughing, or straining) or

Self Care Tips FOR MOTHERS:

Preventing Abdominal and Uterine Ligament Strain

"Jackknifing" forward from a supine or sidelying position to a seated position causes strains and spasms to uterine ligaments and can contribute to diastasis of the rectus abdominus. Many women experience this discomfort, yet do not recognize this contributor to its occurrence.

Pregnant women on the massage table will need to reposition several times and possibly get up in the middle of session to use the restroom. It is particularly important for the mother to use care when moving from the lying to the sitting position. Whether on a massage table, in bed, or on a couch, she can use this method for sitting up without strain.

First remove any pillows between or under her legs. She should roll to her side first if she is not already lateral. Bending her legs, she will then use her arms to push her upper body up to a sitting position (Figure 3.5). Finally, she will swing her legs over the side of the table, keeping her knees together. This prevents straining of the abdominals when sitting up. She should always sit for a moment on the edge of the bed or couch for a moment before getting up, to avoid instability due to dizziness from postural hypotension.

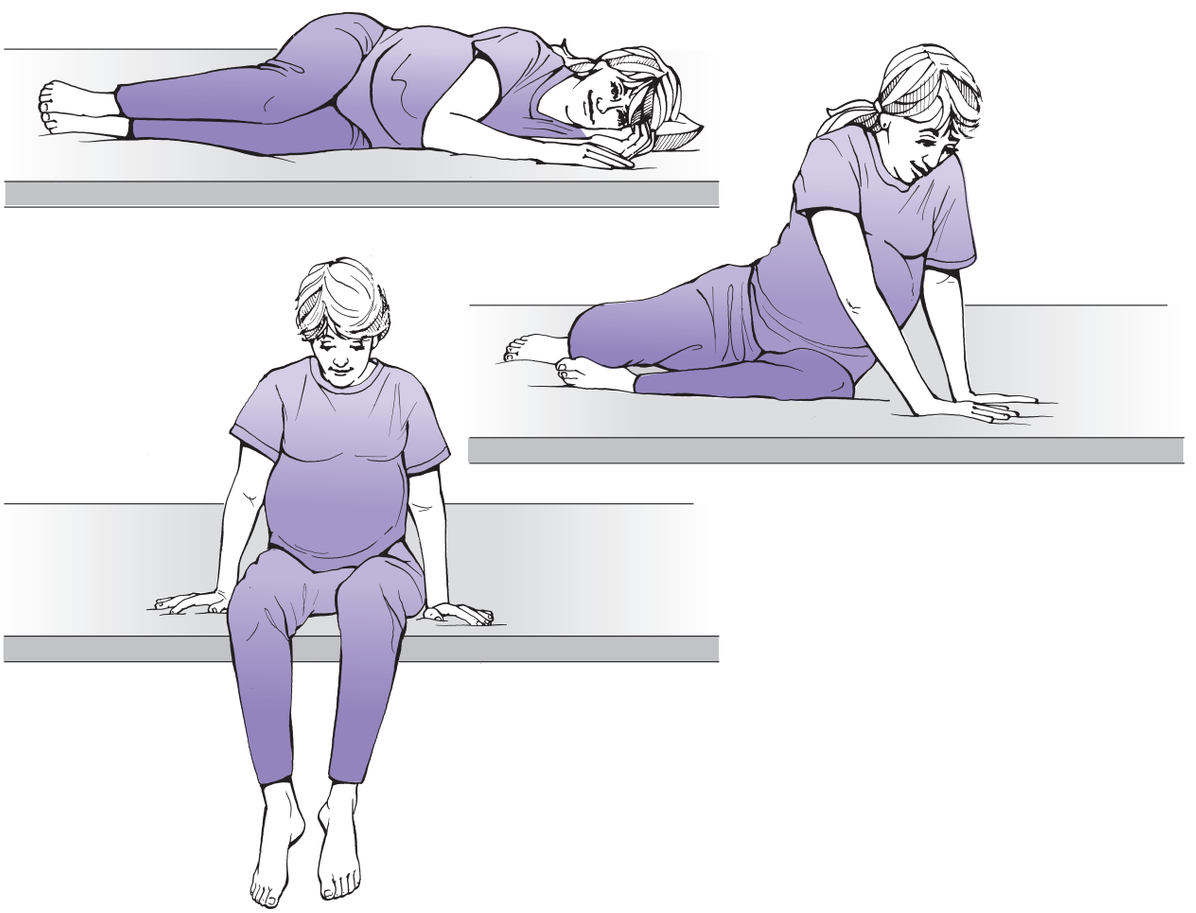

FIGURE 3.5 **Body mechanics of repositioning from lying down to sitting.**

To prevent strain to the abdominals and uterine ligaments, always remove the pillows first, then have the client roll to her side and push herself up using her arm and hand strength, rather than straining her abdominals. Have her sit on the edge of the table for several minutes if she feels dizzy.

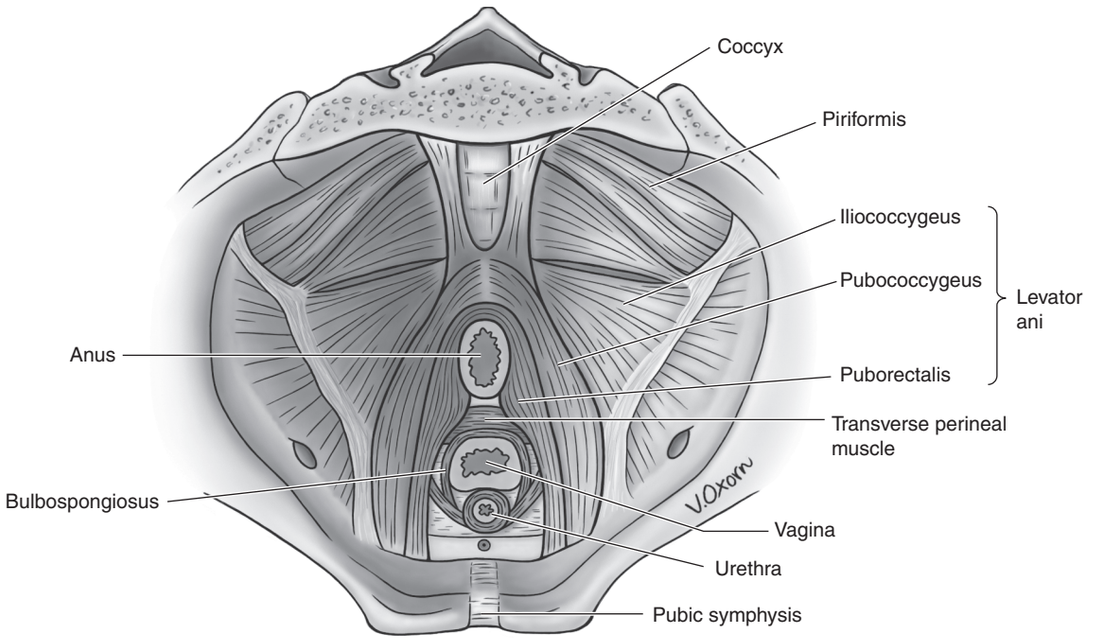

FIGURE 3.6 **Perineal musculature and pelvic bones.**

The primary pelvic floor muscles include the group called the levator ani, the transverse perineal muscles, and the bulbospongiosus. These hang like a hammock between the ischial tuberosity, the symphysis pubis, and the coccyx. (From Moore KL and Agur A. Essential Clinical Anatomy, 2nd Ed. Philadelphia: Lippincott Williams & Wilkins, 2002.)

continual leakage of urine, and uterine or bladder **prolapse** (when the organ slips down toward or literally drops out of the vagina). **Kegel exercises** are an effective method for helping prevent these complaints by toning the muscles and improving circulation. There are many benefits to practicing Kegel exercises regularly, as described in Box 3.3.

Weak perineals are another possible cause of the common complaints during pregnancy of dull, aching low back and pelvic discomfort. As a bodyworker helping a woman cope with her physical changes during the perinatal cycle, passing on information about the benefits of Kegel exercises could be a great service to her. Awareness of the perineal support to the torso can be increased by combining client-activated perineal muscle contractions along with muscle-release techniques in the low back, hip rotators and adductors. The perineal contraction and release can enhance the effectiveness of the other muscular release.

BOX 3.3 | Benefits of Kegel Exercises

Kegel exercises improve the following:

- Circulation and health of the perineal area
- Bowel elimination
- Sexual pleasure and responsiveness
- Elasticity of perineal tissue
- Perineal strength for pushing during birth
- Familiarity with the perineal area, potentially easing associated psychological discomforts during childbirth
- Postpartum tone of vaginal muscles
- Perineal healing in postpartum

Kegel exercises reduce the following:

- Hemorrhoids and vulvar varicosities
- Occurrence of urinary incontinence
- Episiotomy or perineal tearing at birth
- Organ prolapse and low backaches associated with partial prolapsed

The following instructions can be offered to your client, but learn to do the exercises yourself first, so that you can describe them effectively. There are no contraindications to Kegel exercises; they are useful prenatally, in postpartum, and throughout a woman's life. Men can do Kegels as well.

General Instruction for Kegels

For more comfort, always be sure to empty the bladder before doing these exercises. To have the most beneficial effect, one must do the exercises several times a day. Dr. Kegel, who developed a successful perineal exercise routine in the 1940s, prescribed three 20-minute sessions per day, but even 10 minutes per day will strengthen the muscles as opposed to doing nothing at all. There is no need to stop all other activities to do these exercises once you are familiar with them; they can be practiced during work, at the movie, or driving a car, and no one else will ever know!

If you are uncertain how to do a Kegel exercise, try stopping the flow of urine mid-stream when voiding. These are the same muscles used for a Kegel. Use this as a way to identify the muscles to be toned, but do not practice with the urine flow regularly, especially with a full or irritated bladder, as the bladder can become aggravated by the practice.

Beginning Kegels

Once you know which muscles to use, begin with the following:

1. Sit in a chair with feet flat on the floor. Inhale.
2. On the exhalation slowly press the knees and inner thighs together, contracting the vaginal muscles at the same time. Hold until exhalation is completed or 6 seconds.
3. Relax with an inhalation and repeat the tightening and relaxing practice for 5 to 20 minutes.

Intermediate Kegels

When the beginning exercise is easy, start practicing Intermediate Kegels:

1. Sit or lie in comfortable position. Close your eyes. Allow your breath to fill your pelvic area and imagine there is a small elevator full of people in your pelvis that will rise from the bottom of your perineum up to your navel.
2. As you exhale, squeeze the perineal muscles, bringing the "elevator" slowly up toward the navel or to the highest level it can to go. Hold there for at least 6 seconds and imagine all the people getting off! Breathe normally while holding the contraction.
3. Now, on another exhalation, slowly lower the elevator, one floor at a time, back to ground level.
4. Relax and repeat as many times as possible.
5. On some occasions, bring the "elevator" all the way to the "basement," pushing slightly downward and allowing the perineum to relax.

Abdominals

The abdominal muscles help maintain the position of the inner organs and uterus, stabilize the low back, and control the angle of pelvic tilt—all important jobs during pregnancy. They also assist with breathing and are activated with any trunk flexion, pulling, straining for bowel movement, coughing, laughing, and pushing a baby at delivery. They are lined and covered by connective tissue that joins together at the linea alba between the xyphoid process and the pubic symphysis.

Four layers of abdominal muscles cross the anterior torso, vertically, horizontally, and diagonally, and are often described as being like a corset, with the rectus abdominus as a front vertical panel, the transverse abdominus crossing horizontally and the external and internal obliques overlapping each other on the sides.

Diastasis Recti

By the end of pregnancy, the abdominal muscles have stretched considerably. If they are weak, the abdominals will not provide the necessary upward and interior support. As they stretch, the fascial linea alba where the rectus abdominus inserts, begins to thin and stretch as well, causing the abdominal muscles to spread apart from the linea alba. It is normal to have a slight separation during pregnancy: some diastasis develop in the second trimester while most occur in the third trimester or while pushing during labor. Statistically, most separations tend to occur at or above the umbilicus, but in personal practice, I have found most below the navel.

If the abdominals separate an inch, or 2 fingerwidths, the condition is known as a **diastasis recti** (Figure 3.7). With a 3- to 4-fingerwidths separation, low back pain increases as abdominal support decreases. A severe diastasis recti can impact a woman's pregnancy and birth and cause long-term back discomfort. Women who are more prone to a serious separation often have one or more conditions in which the abdominals become larger than normal.

MASSAGE THERAPIST TIP

More About Strengthening the Pelvic Floor

Below are some tips on helping your client understand and perform Kegel exercises:

- There are many ways to do Kegels. They can be done rapidly or slowly. A client can invent her own methods of practice. Use imagery to enhance the client's ability to sense the muscles, such as visualizing wringing out a sponge and then relaxing like the soft petals of a flower bud as it opens.
- Advanced Kegel exercises include focusing on squeezing each separate sphincter muscle individually—the anal, vaginal, and urethral sphincters.
- Kegels are most effective when the muscles at the upper-third and middle-third of the vagina are developed. Encourage your client to think "high." She may place one hand over her pubic bone or at her navel and envision that she can tighten the vagina to that level.
- Remind your client that quality is better than quantity for improving muscle tone.
- Remind your client to practice relaxing her breath while doing these exercises. There can be a tendency to hold the breath or clench the jaw when tightening the perineum.
- To prevent general strain on the perineal muscles, encourage your client to brace her abdominal muscles and do a Kegel squeeze before and during coughing, straining, or lifting.
- Some women may have very weak perineal tone and may be unable to hold a Kegel contraction at all or only for a very short time. With a regular practice regimen, the improvement will be rapid and obvious.
- Some women have a greater need for learning to relax the perineum, as opposed to strengthening. If she finds this is the case, she can practice releasing and relaxing the perineum by visualizing a softening of the pelvic floor, and pushing outward slightly as she exhales.

Traditional Birth Practices:

Support for the Belly

In many parts of Latin America and South America, women in traditional cultures wrap a cloth shawl around their abdomen during the second part of pregnancy. This cloth usually wraps beneath the abdomen several times and ties in the back. It acts as a support for the stretched abdominal muscles, holding the weight of the uterus and relieving stress to the low back. With this type of anterior support, as well as its constant pressure against the low back, postural issues may not develop as intensely as they could for a woman who has a large belly, weak abdominals, and no external support.

Possible contributing factors to diastasis recti are listed in Box 3.4. Be aware of these risk factors as you work with your client, and teach her proper body mechanics for getting on and off your massage table to help avoid undue strain to the abdominals.

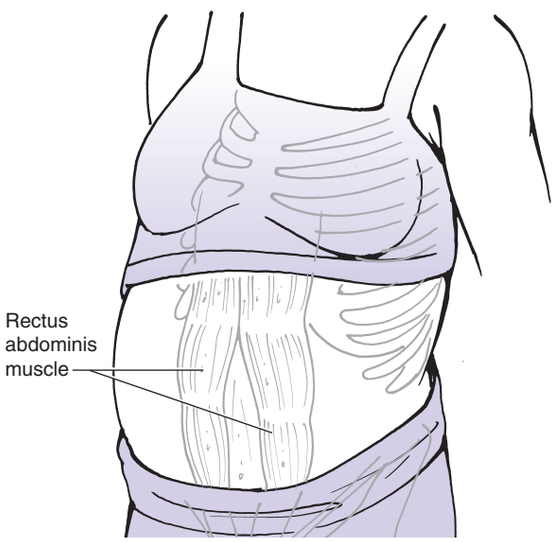

FIGURE 3.7 Abdominal muscles and diastasis recti
The abdominal muscles support the torso like a corset. With the stretching of the belly, the fascial linea alba thins and stretches, sometimes causing the rectus abdominus to separate in a diastasis recti.

BOX 3.4 | Conditions Contributing to Diastasis Recti

Pregnancy Risks

- Large baby for the mother's size
- Multiple pregnancy (twins or more)
- Excessive amniotic fluid (polyhydramnios)
- Multiple births without sufficient recovery time between
- Pushing hard at birth with weak muscles
- Relaxin and estrogen softening and weakening connective tissue

General Risks

- Obesity
- General weakness due to lack of exercise
- Straining due to constipation
- Previous hernias or diastasis recti
- Improper body mechanics when repositioning from lying to sitting or standing

When Diastasis Occurs

Many women do not know when or if their abdominals have separated. There is often no obvious sensation or sign when it occurs; it may happen over a period of time, and it is not generally painful to the abdominal muscles. However, a woman with a diastasis of 3 or more fingerwidths will lack the anterior support for carrying the weight of the baby. Without the normal abdominal support, the posterior spinal muscles compensate and become strained and taut as they attempt to maintain a woman's posture without anterior assistance. The woman may complain of nagging low backache and may notice a strange bulging somewhere along her linea alba when her belly is flexed, as the abdominal contents are pushed through the opening. In extreme cases of diastasis recti, the bulge of the baby may be seen protruding through the opening quite distinctly.

Bodywork Considerations for Diastasis Recti

Below are some things to consider when adapting bodywork for women with diastasis recti:

- Ask your client whether she has experienced diastasis recti in pregnancy and/or postpartum, and if so, suggest that she consult with a physical therapist about preventative and corrective exercises, or read Elizabeth Noble's book, *Essential Exercises for the Childbearing Year,* which describes in detail methods of preventing and repairing diastasis recti. (See Appendix B, Resources of the Practitioner.) Many women find that prenatal Pilates and yoga classes, which focus on developing this core abdominal strength, can be helpful.
- Offer proper support for the pregnant belly in the second and third trimesters when positioning the client sidelying. (See Positioning, Chapter 5.)
- Teach the client proper body mechanics for rising from lying to sitting. (See "Massage Therapist Tip" below.)
- Suggest the use of an abdominal support binder in late pregnancy for women with especially large abdomens.

When to Assess for Diastasis Recti

Assessment for diastasis recti should be done when beginning work with a client *in the first trimester* who has had previous births (and therefore may have a diastasis already) and who you expect to see throughout pregnancy, or when you have a postpartum client. This will help you ascertain risk for and cause of some back discomforts, and establish the need for corrective exercises. An assessment can be done anytime there is reason to think a separation may have occurred. Remember that if this is a woman's second or more baby, she may begin this pregnancy with a separation which developed in a previous pregnancy and of which she may be unaware.

In the late second and through the third trimester, when the abdomen is large, corrective exercises could possibly aggravate or worsen her condition if she already has a significant separation. An *assessment* can be done however, if needed, if she has predisposing factors toward separation or she is complaining of chronic backache. If a diastasis is found, she can discuss with her prenatal care provider about the benefits of using an abdominal support girdle and about possible referral to a physical therapist who might be able to assist her in preventing further separation of the rectus during the final stages of her pregnancy.

Case Study 3.1:
EXTREME DIASTASIS OF THE RECTUS ABDOMINUS

Caitlin had been in labor for several hours and was now pushing when her massage therapist, Ann, came in the room to support her. This was Caitlin's fourth child. The other three were ages 5, 3, and 2. Caitlin's abdominal muscles had had little time to recover between births, and she had complained for months during this pregnancy about hip and back pain.

As Ann helped Caitlin lean forward to push with the coming contraction, she saw a large bulging shape in Caitlin's abdomen. As she pushed, a pointed, moving form slid and pressed out through the abdominal wall, looking, as Ann said later, like an alien emerging from Caitlin's belly. Caitlin had an enormous diastasis recti, and the baby's arms, elbows, legs, or feet kept pushing forward through the abdomen as the mother strained with pushing.

Caitlin said she had noticed the baby poking through now and then over the past months, but had not been instructed after the prior pregnancy in ways of correcting the separation. She had not realized that it was contributing to her back pain.

Several weeks after delivery, Caitlin came to see Ann for a massage. Ann subsequently assessed her abdominal diastasis and found a separation the size of 4 fingerwidths. Having watched how the baby pushed through the abdomen when Caitlin was holding her breath and pushing, Ann realized why it is important to do corrective exercises on an exhalation. The increased abdominal pressure with breath-holding forced the abdominal contents through the rectus separation. She showed Caitlin simple curl-up exercises and had Caitlin push her abdominals together with her hands when she did the curl-up. She also passed on contact information for a local physical therapist who could help her with more in-depth muscle strengthening to correct the separation.

It took Caitlin many months to begin to notice the gap in her abdominals getting smaller. It was difficult for her to find time to focus on corrective exercises, but she did her best to continue the abdominal strengthening and other exercises prescribed by her physical therapist. After 6 months, according to her report to Ann, she was feeling stronger and more stable in her hips and low back.

How to Assess

Essentially, to activate the abdominals to assess for a diastasis, the client must do an abdominal crunch. The following is the method for a client in her first trimester:

1. Have client lie supine with knees bent.
2. Place your fingers just below and above her navel in the center of abdomen.
3. Have the client exhale while slowly raising her head off ground. This will activate her abdominals. In the first trimester, if the abdominals do not tighten well enough to palpate, ask her to lift her shoulders off the ground along with her head (Figure 3.8).

CAUTION: Ensure that the client exhales during the head lift muscle activation. Breath holding with exertion will increase intra-abdominal pressure and could increase the diastasis.

4. With her abdominals contracted, press lightly on the linea alba and slide your fingertips laterally until you reach the edge of the abdominals, which will feel rigid. If there is no gap, your fingers may not move at all before touching the muscular edge. If there is a gap, your fingertips may slide out to either side 1 or more inches. Measure in fingerwidths by extending your fingers together between the edges of the abdominal wall.

CAUTION: If you feel the need to check in the late second or in the third trimester, the separation may be visually apparent as a bulge. Do not press your fingers into the abdomen, but instead observe for this bulge just above or below the navel.

A slight gap of 1 to 2 fingers is considered normal. Three fingers or more indicates the need for corrective exercises. Even without a gap, preventative exercises, such as abdominal crunches and those taught by a physical therapist, practiced in prenatal Pilates classes, or learned from Noble's book mentioned above, should be started in the first trimester and continued through the pregnancy. The good news about diastasis recti is that minor separations of less than 2 fingerwidths tend to correct themselves in postpartum even without specific exercise, and larger ones are generally correctible with exercise.

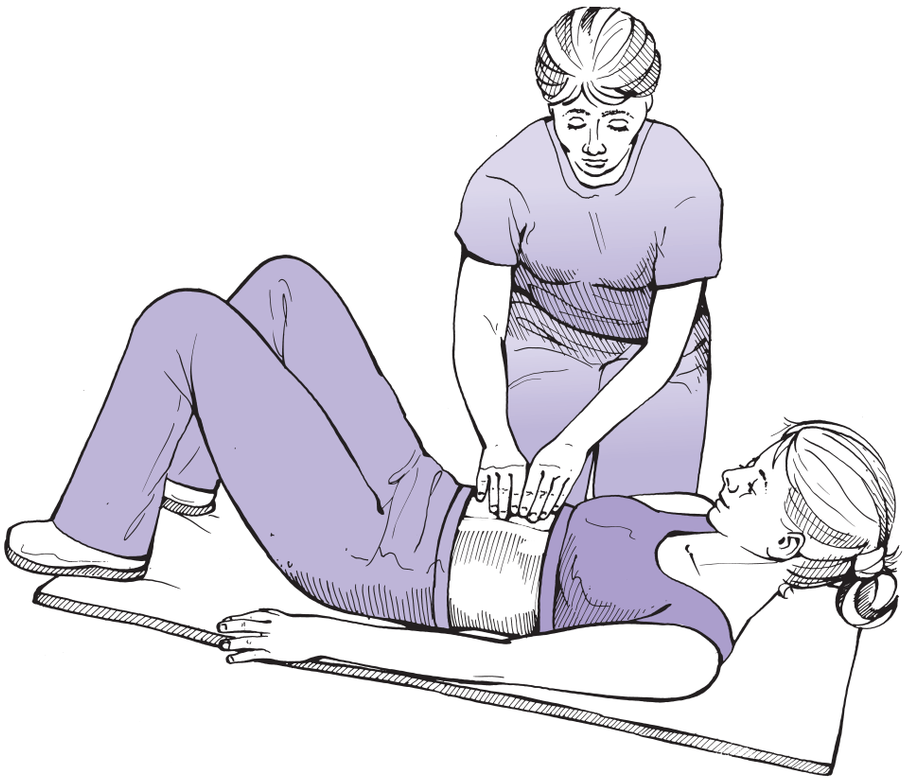

FIGURE 3.8 **Assessing diastasis recti.**
Have client lay supine and lift head while exhaling. Palpate above or below navel on linea alba for a gap between edges of rectus abdominus.

Psoas

The iliopsoas is a primary hip flexor that helps support the low back, the fetus, and the abdominal contents. It orients the tilt of the pelvis, helps hold the body upright, and stabilizes the spine and pelvis. In pregnancy, as the ligaments that normally stabilize the low back and pelvis are stretched and softened by relaxin and estrogen, they become less reliable and the psoas must work harder. When your client is standing, a tight psoas will pull down on the anterior lumbar vertebrae rather than flex the hip; this action will cause shortening of the lumbar spinal muscles and an increased anterior pelvic tilt (Figure 3.9).

A circular problem develops: when the psoas tightens, the anterior pelvic tilt increases; when the anterior pelvic tilt increases, the uterine weight shifts forward. With the weight fallen more forward, the abdominals stretch and lose tone, causing an even greater increase in pelvic rotation. In addition, if the psoas is tighter on one side than the other, pelvic alignment will shift, causing strain and discomfort on the entire side of the body that is trying to compensate for the imbalance. A tight or spasmed iliopsoas will often be experienced as low back pain, sacroiliac pain, anterior thigh pain, sciatica sensations, and sometimes as pain in the iliacus area. It may also cause concomitant dysfunctional adaptations with the hips, knees, upper back, lower back, neck, feet, and ankles.

To address this issue, the psoas must be stretched and toned to release tension on the lumbar spine and to allow the pelvis to support the spine most efficiently (see the section "Low Back Pain" in Chapter 5). Postural education is also a very important tool to assist the psoas in supporting a properly balanced pelvis.

CAUTION: The psoas should not be massaged with direct hand or finger pressure at any time during pregnancy. While the psoas can be accessed during the first trimester without touching the uterus, it is avoided, since deep abdominal massage is contraindicated during the first trimester due to the desire to avoid associations between bodywork and miscarriages that occur commonly in the first trimester. (This is discussed in more detail in Chapter 4.)

Case Study 3.2:
POSTURAL ASSESSMENT

Cindy saw her new pregnant client, Lynn, walking up the path to her office. Lynn was holding her back with one hand and appeared to be waddling slightly as she walked. She was 38 weeks pregnant in her fourth pregnancy, with three young children at home. Today was her first massage with Cindy. From her health intake form and through questions during the initial interview, Cindy learned that her client had been having generalized back pain for the past 4 weeks of her pregnancy, and had found little to relieve it. She said the pain was a general aching across her low back. She indicated the area by placing her hand just above her posterior ilium and along the QL. At times she felt twinges of pain down her left leg. She said she felt general tension in her neck and shoulders and was tired of being pregnant. Her doctor told her these were normal pains that she could expect from being pregnant. She otherwise had had no abnormal or high-risk conditions and no other discomforts, apart for some morning sickness in the first months. She stated that she was carrying an extra 25 pounds or so that she had gained during the last pregnancies and had not lost.

Cindy asked Lynn to stand in a relaxed posture for a moment so she could observe her stance. She noted that Lynn's hips, knees, and feet were laterally rotated. Lynn's tendency was to hold her low back with one hand, and arch her back to support the weight of her abdomen. Cindy also noted that Lynn's belly seemed larger than most clients' she had seen at this stage. She was aware that the size of the woman's belly at any particular stage of pregnancy was dependent on the size of the baby, the position the baby tended to favor, and the tone of the mother's abdominals. Lynn stated that this baby was bigger than her others, and that they expected it to be at least 8 or 9 pounds.

When asked about exercise, Lynn stated that she had never had an exercise routine. During the early part of this pregnancy, she had been so nauseous that she had stopped doing even the more basic activities that she had once participated in. She said she was busy enough as a mother of three and got exercise lifting and carrying the children.

Reassured that Lynn had presented her discomforts to her doctor and that no abnormalities had been found with Lynn's pregnancy, Cindy considered several factors that might be affecting Lynn's backache:

1. Mother of young children: Cindy knew this entailed frequent lifting, leaning over with the weight of a baby or child to put him or her in a car seat, and carrying children on one hip, shifting posture to the side to carry the child.
2. Fourth pregnancy: Cindy realized that the more pregnancies and deliveries a woman has had, the more risk she has for loss of abdominal tone, hypermobile ligaments, and diastasis recti.
3. Lack of exercise: Without regular strengthening exercise, Lynn was more at risk for developing stresses and strains during and after pregnancy.
4. Excess weight: With Lynn's extra weight gain on top of her pregnancy weight, she also increased her risk of diastasis recti and low back pain.
5. Poor posture: Lynn's poor posture, exacerbated by her weak muscle tone, also increased the strain on her muscles.
6. Large breasts: Lynn had large breasts, which influenced her posture as well, causing her to sink in her upper chest, resulting in upper back and neck pain.

Cindy helped Lynn notice how she was standing at the moment, and then suggested that she move her feet hip width apart, and turn her feet so they faced straight forward. Holding onto Lynn's heels, she encouraged her to sink her energy into the floor, feeling the soles of her feet grounded on the floor. Then she slid her hand up the back of Lynn's legs, sacrum, and spine to reach her cervical spine, where she pulled up under her occiput and encouraged Lynn to inhale deeply, expanding her ribs and chest. For several breaths, Cindy encouraged Lynn to imagine being 2 feet taller than she was, with that length rising up from her feet, all the way through her head. Lynn was shocked at how much more easily she could fill her lungs, and how much tension immediately left her low back. Postural awareness had not been something she had considered with regard to her pregnancy discomforts.

On the massage table, Cindy spent a moment assessing Lynn's abdominals in the supine position, asking her to exhale, and raise her head slowly. She immediately saw a bulging ridge in the middle of Lynn's abdomen and assumed she might have a diastasis of the rectus muscles. She explained what this was and all the factors that would contribute to this. Cindy suggested that Lynn have her doctor assess it further to confirm it, or have it reassessed after birth when she could begin strengthening exercise.

Cindy offered to work with Lynn on postural correction over the next weeks, and during postpartum, and showed her where to get information about corrective exercises.

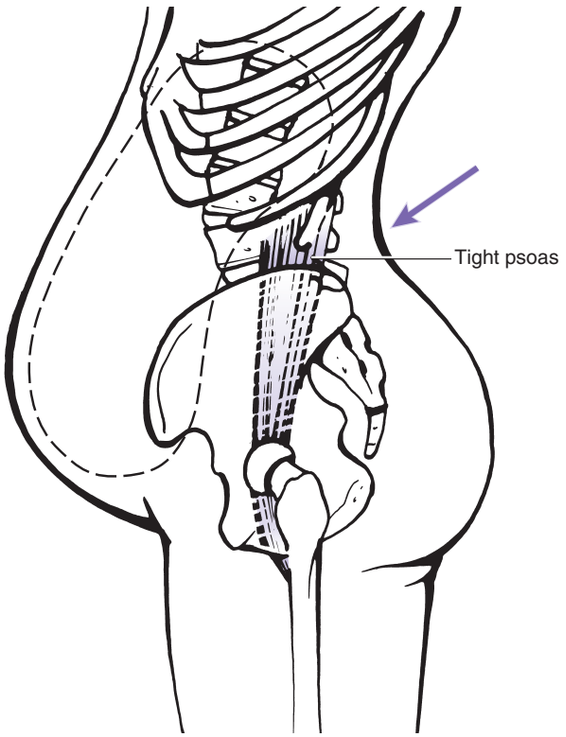

FIGURE 3.9 Effects of a tight psoas on posture.
When your client is standing, a tight psoas will pull down on the anterior lumbar vertebrae, rather than flexing the hip; this action will cause shortening of the lumbar spinal muscles and an increased anterior pelvic tilt.

Note: Despite the contraindication of abdominal massage during the first trimester, if useful and if agreeable to the client, gentle myofascial work just inside the iliac fossa without going deep into the abdomen, can be appropriate, even in the first trimester. Below are some bodywork considerations for the psoas.

- Encourage the client to explore comfortable ways of stretching the psoas herself, such as in the lunge position. (See Chapter 6)
- Assisted stretches while on the massage table will help alleviate problems associated with tight psoas.

Quadratus Lumborum

The QL is an important stabilizer of the low back that assists spinal extension when it bilaterally contracts, helps the trunk flex laterally, and fixes the twelfth rib during respiration. It extends from the posterior iliac crest to the lower border of the twelfth rib and attaches on the lumbar transverse processes. In pregnancy it becomes shortened due to anterior pelvic tilt and lumbar lordosis. Many women may experience soreness, spasm, or general aching in the QL during pregnancy, yet many others are unaware of its tension and relation to their low back discomfort until it is touched with massage. Due to a mother's increased hip and waist size, it can be difficult, yet still important, to access this muscle during pregnancy and help it release with massage and stretches.

Below are some bodywork considerations for the QL:

- See the section "Low Back Pain" in Chapter 5 for specific ways of working with the QL.
- Passively stretch the QL while the client is in the sidelying position, by using a wedge or pillow under her waist, extending her waist on her upper side. (See Figure 6.2A.)
- Encourage the client to explore comfortable ways of stretching the QL herself. (See Chapter 6.)

CHAPTER SUMMARY

Primary musculature is stressed by pregnancy due to normal weight gain and necessary adjustments in posture to support the anterior weight of a growing baby. The psoas, QL, pelvic floor muscles and the abdominals are core muscles that support and stabilize the pelvis during pregnancy. Using the information in this chapter, you can help a client have a sensory understanding of appropriate posture for her stage of pregnancy. By reviewing her posture at each massage session or least once each trimester, along with suggesting resources for learning to stretch and strengthen primary muscles, you will give your client some tools that aid her search for comfort and stability. In this chapter you learned the importance of muscular strengthening and stretching, and of postural and abdominal assessments. In later chapters you will learn bodywork and particular ways to address these core stabilizing muscles.

CHAPTER REVIEW QUESTIONS

1. Name three muscle groups especially affected by the weight gain and postural changes of pregnancy.
2. Stand in an exaggerated strained pregnancy posture. Which areas of your body feel particularly stressed after just a few moments? Describe how to help a client make adjustments to this posture.
3. Name three factors that have particularly strong influence on pregnancy posture. What postural changes are common to develop during pregnancy?
4. Explain why the iliopsoas is an influential muscle in a pregnant woman's posture.

5. Explain why proper positioning on the table and body mechanics for getting on and off the table are particularly important during pregnancy.
6. Describe what kind of symptoms a woman with uterosacral ligament spasms might experience.
7. Name three benefits of perineal exercises.
8. If a client with three young children came to see you during her fourth pregnancy at 34 weeks, with a pendulous belly and complaining of low back pain, what condition might you suspect could possibly be contributing to her back pain? What would you suggest or how would you treat her?
9. Describe two ways of helping a woman with a large abdomen decrease her risk of straining uterine ligaments. Describe how a client should move from sidelying to sitting position to prevent uterine ligament strain.
10. After the late second trimester, corrective exercises for a diastasis recti are generally not recommended to be started. Explain why this is so and when they can be started.

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