Chapter Three

Structural Changes Throughout Life

Adhesions form as we heal — it's as simple as that. For this reason, virtually all of us have adhesions.

In fact, by the time we reach puberty, literally everyone who has ever had a fall, infection, inflammation, or surgery has developed adhesions. They are part of the natural process of healing and aging. Adhesions become an intimate part of the geography of our body and of our fascial sweater. Let's look at an example.

Healing and Adhesions

Think back to a time you were very young, four or five years old. While playing with friends you fell off your tricycle or slipped while running, landing on your hip. The trauma of the fall set in motion a series of events in your body.

First, you suffered tissue damage from the fall. Small blood vessels ruptured, and cells in the area were crushed or injured. Within minutes, the healing mechanisms of your body started sending out tiny, but very strong strands of collagen. These tiny collagen threads are called cross-links.

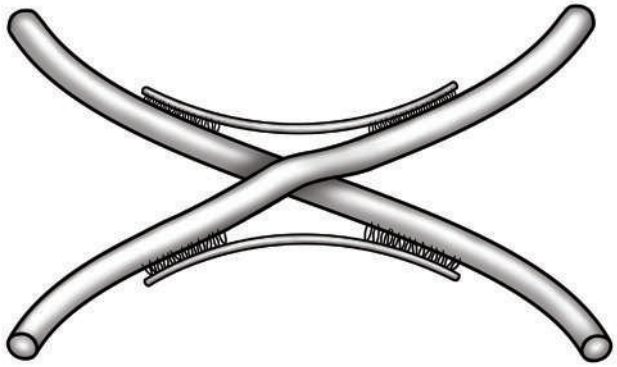
As they attached to the injured tissue and to each other, the cross-links created an adhesive blanket to protect and isolate the injured area from the rest of the body. In the beginning, this blanket was small. It helped stop any bleeding, and it helped prevent bacteria that may have entered your body during the trauma from spreading

beyond the injury site. Thus, it prepared the tissues in that area to heal.



Adhesions may initially form as microscopic ropes, curtains or blankets.

If you were lucky, your body reabsorbed some or all of the cross-links, lessening their glue-like affect. But if the inflammation in the area persisted, the number of cross-links increased. Thus, the micro-adhesions grew into adhesions – or a scar. Cross-links, micro-adhesions, adhesions, and scars refer to the same adherent tissue, the main difference being the size and appearance. Whether large or small, these collagen threads represent the first step in the process of healing.



As the body heals, small but powerful cross-links form between individual fibers of the fascial sweater, permanently restricting movement and sometimes causing pain or dysfunction.

Over the next several weeks, your skin may have undergone some interesting color changes. The trauma may have turned the injured area "black and blue" as your body progressed through the various stages of healing. After several weeks (or months with a bad injury), you noticed that you finally felt little or no pain when that area brushed up against a wall or a piece of furniture. To all your senses, you were healed, and you went about your prior activities.

However, inside of the body, the tissues underwent a significant change. In fact, the adhesive tissues that originally formed to help the body heal after the injury remain in the body. There, they could continue to affect your bodily structures for decades, even for your entire life.

Collagen fibers or cross-links are the "building blocks" of adhesions. Collagen fibers have been measured as having a tensile strength of nearly 2,000 pounds per square inch in the body. Because of its tremendous strength, collagen is ideally suited to be the main structural element of tendons and ligaments, as well as adhesions.

Collagen is one of the main structural elements in fascia. In fact, collagen is so prevalent in the body that it surrounds and separates virtually all of the body's structures, giving them strength and stability, from the largest muscle to the most delicate gland.



Collagenous cross-links can join to form adhesions which glue bodily structures to their neighbors.

But collagen's strength and prevalence in the body can also be a drawback. Collagenous cross-links, adhesions, and scars form within the fascial sweater, or attach to bodily structures after trauma or inflammation. Once formed, these adhesive structures often remain in place long after the original healing process has completed. Since collagen occurs throughout the body, the body produces no solvent to dissolve adhesions or scars. In fact, while you have "healed" from your injury, the tiny adhesions which formed during those first days of the healing process remain in your body — and stay there for the rest of your life!

What Causes Adhesions to Form?

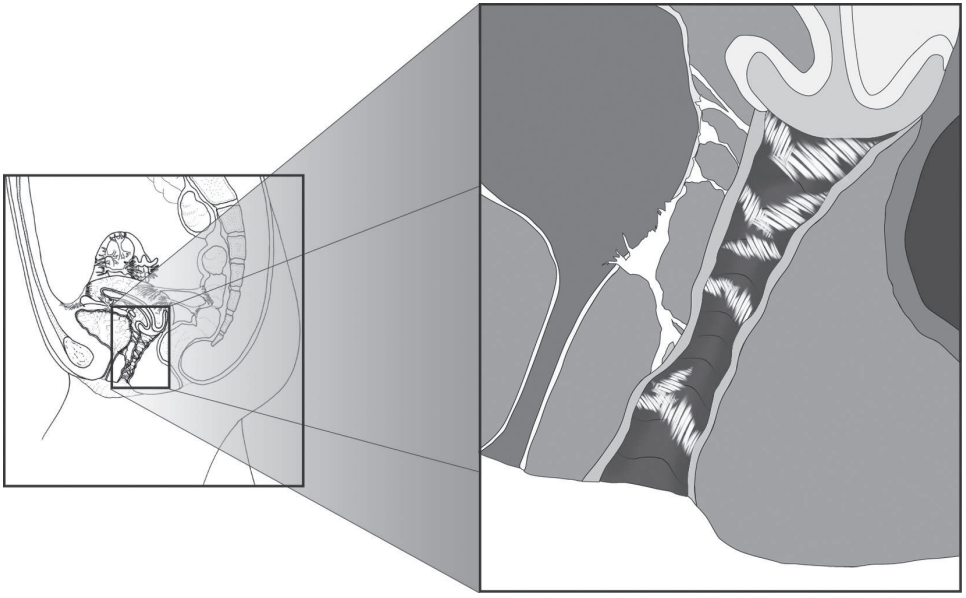
Many people think that because they have not had any major surgery, injury, or accidents, their body is free from adhesions. However, adhesions can form from a variety of causes, including simple infections or inflammations. The next section examines some of the causes we see frequently.

Infection

Infections affect nearly everyone at some time during their life. During the course of an infection, inflammation often forms in the affected area, as the body attempts to contain the infection and fight it off. With luck, the adhesions that form due to infection or the associated inflammatory response will be localized and will not cause great harm. In most cases, they go unnoticed. However, inflammation and the resulting cross-link formation can adversely affect the more delicate tissues of the body.

SIX COMMON CAUSES OF ADHESION FORMATION

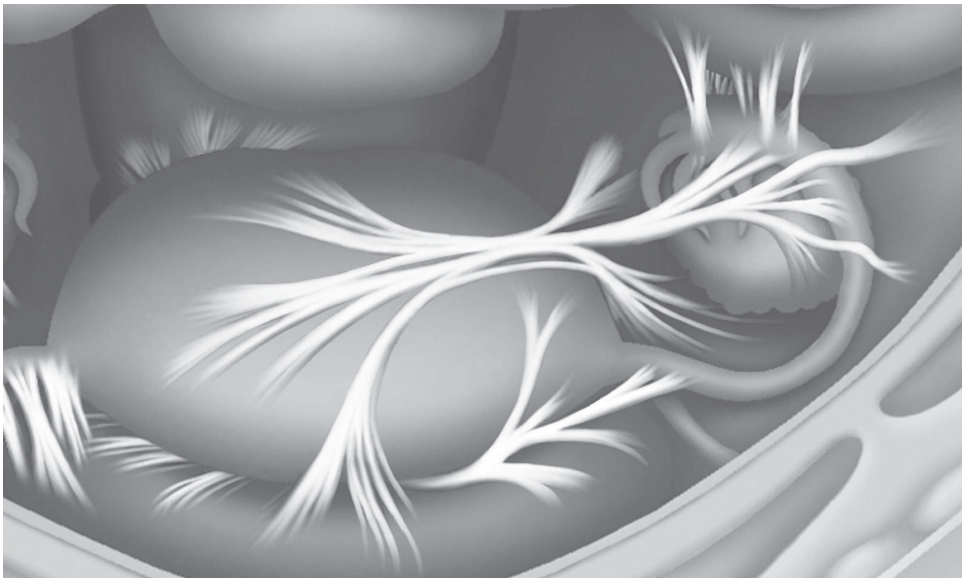
- Infection
- Inflammation
- Surgery
- Trauma
- Radiation therapy
- Chronic poor posture



Adhesions may form on the warm, moist walls of the vagina due to bacterial infection, trauma, or abuse.

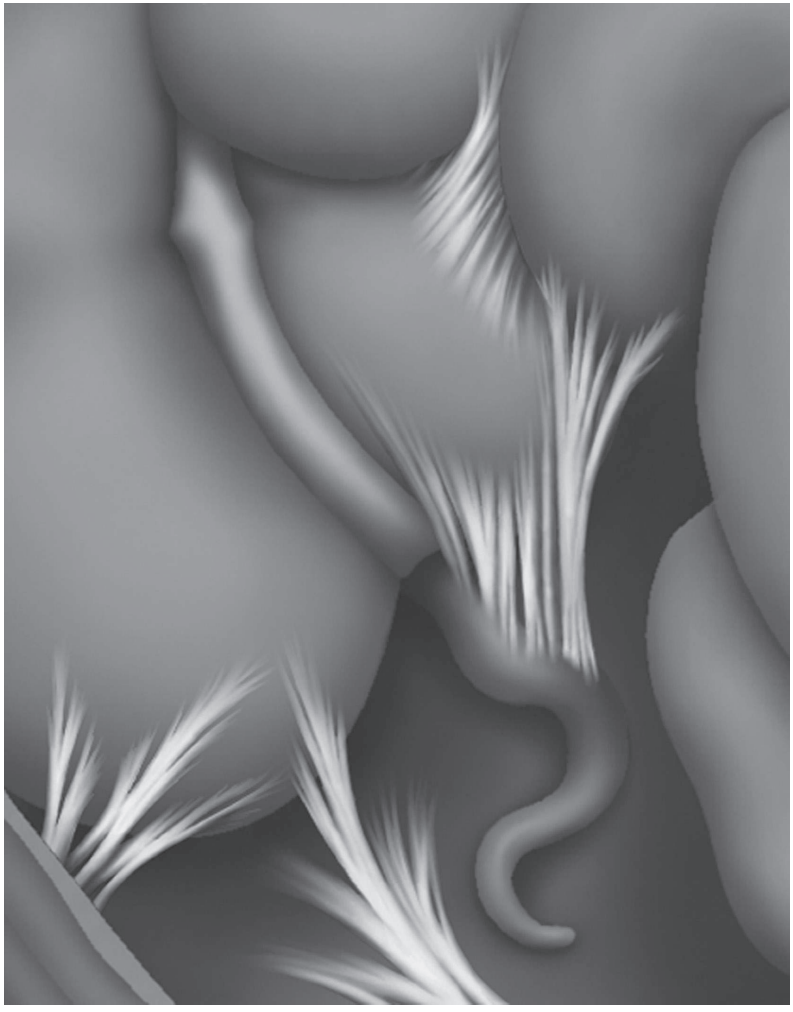
The female reproductive tract is one of the most common areas of infection in the body. The warm, moist tissues of the vaginal walls are designed to promote life, as are the nearby tissues and structures of the cervix and uterus. Thus, they form a near-perfect environment for bacterial infection. Besides trauma to the coccyx (tailbone) which is the closest neighbor to the cervix, the vagina itself is a frequent site of infection and cross-link formation.

Items that enter the vagina may not always be as clean as we hope. Through tampons, a partner, or even self-exploration, items enter the semi-closed tissues of the vagina from the outside environment, exposing those delicate tissues to bacteria from the world outside.



Adhesions from vaginal or bladder infections can spread into the uterus, fallopian tubes or ovaries.

Vaginal and bladder infections are considered by many to be a normal part of life. Unfortunately, even minor bacterial infections may create tiny adhesions as the body responds to the bacterial invasion. These infections can cause inflammation deep within the vagina that can later produce adhesions. These vaginal adhesions may later cause pain with intercourse, or create an adhesive pull into nearby structures such as the cervix, bladder or rectum, causing pain or decreased function of the organs responsible for reproduction or elimination. Chronic constipation or infertility are common complaints of women we treat with histories of vaginal or bladder infections.



Inflammation that occurs anywhere in the body (such as the intestines shown here) can cause adhesions to form, binding structures that must move freely, for proper function.

Inflammation

Inflammatory conditions such as endometriosis, pelvic inflammatory disease (PID), cystitis, and vaginitis are often intimately associated with adhesion formation. As with physical injury, the body's response to inflammation is to lay down collagenous cross-links, the building blocks of adhesions. As noted earlier, these cross-links are designed to create a blanket which covers and isolates the inflamed tissue, but in doing so, they can glue structures together with a tensile strength of nearly 2,000 pounds per square inch.

Even when the body is fully able to recover from the inflammation, the adhesive blanket that formed to contain the original inflamed tissues remains in the body for life. When this happens, these tiny but strong straight-jackets become part of the intricate network of the structure of the body, a permanent record of the times that the body healed.

Once glue-like adhesions form, they may pull on structures as we walk, breathe, or perform other daily activities. This pull can itself cause inflammation. Thus the process of inflammation and adhesions may continue as a process of ongoing adhesion growth, binding more tissues and structures over time.

A few examples of inflammatory disorders that can create adhesions in the abdomen and pelvis are listed below:

- Colitis
- Irritable bowel syndrome
- Diverticulitis
- Bowel obstruction
- Gastritis gastroenteritis
- Cholecystitis
- Perforated ulcer
- Pelvic inflammatory disease (PID)

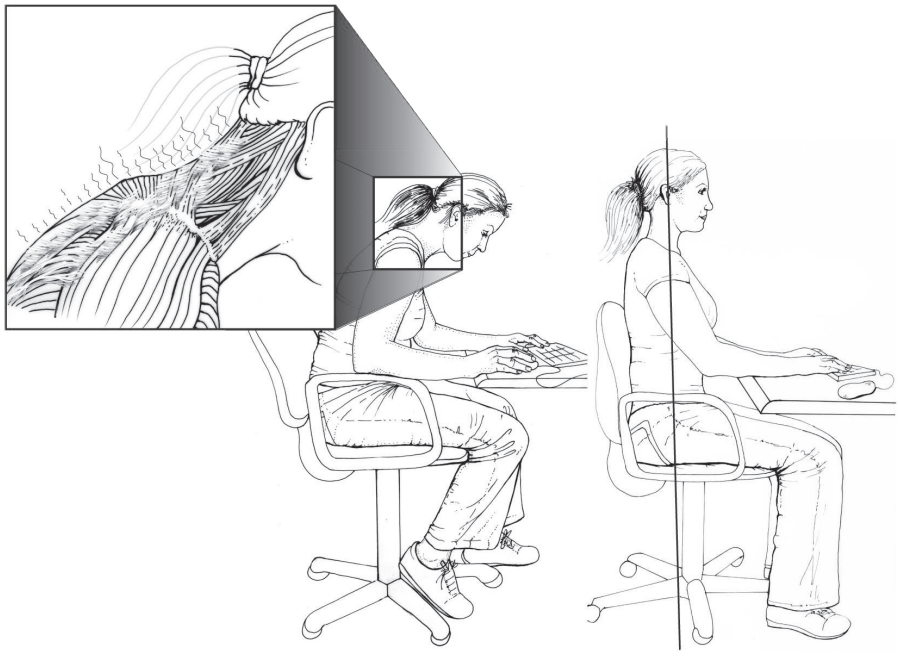
- Endometriosis
- Cystitis or vaginitis
- Perforated diverticulum, small or large bowel
- Appendicitis, ruptured appendix
- Hepatitis
- Ruptured ovarian cyst

Chronic poor postures

Over the years, we have noted that adhesions appear to form in patients along tension vectors due to chronic, poor, or compensatory postures. Scientists have documented adhesion formation in areas that receive less movement than normal, such as when a joint is placed in a cast. In fact, scientists took a dog that was perfectly healthy and put his knee in a cast so he could not bend it. When they observed the knee joint six weeks later (arthroscopically), adhesions had already begun to form, presumably due to the lack of movement in that joint.

The same process appears to happen in humans when we are forced to maintain chronic poor postures for extended periods of time. Clinically, we often note significant thickening and hardening in the muscles that support these chronic postures — such as in the neck and shoulders of dentists, therapists, hairdressers, gynecologists, students, and office workers who must work with their head and arms in front of them or in asymmetrical positions for hours at a time, day after day.

It is an unfortunate fact of modern life that people who sit in front of computers for many uninterrupted hours tend to develop spasms due to the constant strain on muscles in the neck and upper back, muscles that are working overtime to hold the head in place. Over time, this spasm creates chronic inflammation. The body's response to this inflammation is to form adhesions in the necks, shoulders and upper backs of office workers and other people who adopt chronic forward head postures.



Prolonged "forward head posture" can cause muscles to fire continuously. The resulting spasm and inflammation can create adhesions that cause pain and tightness.

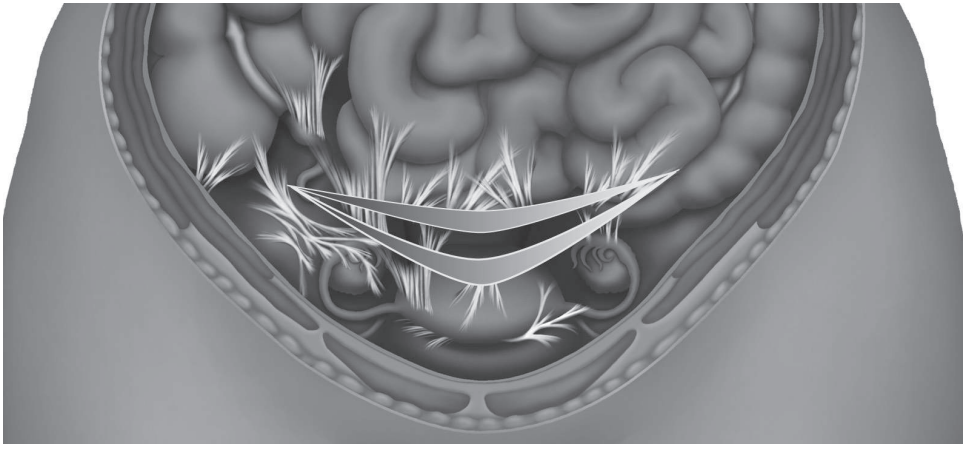
Good seated posture happens when the head is balanced upright over the shoulders, letting the muscles of the neck relax. When sitting or standing properly, a vertical line can be drawn from the ear though the shoulder and hip joints. This posture occurs naturally in most young children. But later in life, when people sit for hours at a time at desks at school and work, their bodies tend to change that posture into a "forward head position." In that position, the muscles in the back of the neck, shoulders, and upper back need to tighten for hours at a time, just to keep the head from falling forward onto the chest.

While the muscles in the back of the neck are strong, they are not designed to hold static positions (such as at a desk or computer) for

hours at a time. As hours, months, and years go by, recurrent poor posture causes the muscles to become inflamed, and cross-links begin to form within the muscles in the back or sides of the neck. When the head lifts up to look at a computer screen, stiffness or pain in the neck or at the base of the skull often occurs, sometimes accompanied by headaches. Uncorrected over time, the pain and stiffness can migrate into the shoulders, mid-back, and finally into the low back as all the muscles of the back struggle to correct the poor posture. Thus, a "stiff neck" or a "stiff back" results, and may grow worse over time if not corrected.

Surgery

Surgeries save lives every day. The very idea that during laparoscopic surgery, a physician can enter the body via a viewing scope or scalpel, repair damaged structures, and exit again, leaving the body in better shape than before, is an incredible testament to the wonders of modern medicine. The advances in surgery over the last 50 years have been remarkable, and surgeons develop more effective and less traumatic surgical techniques with each passing year.



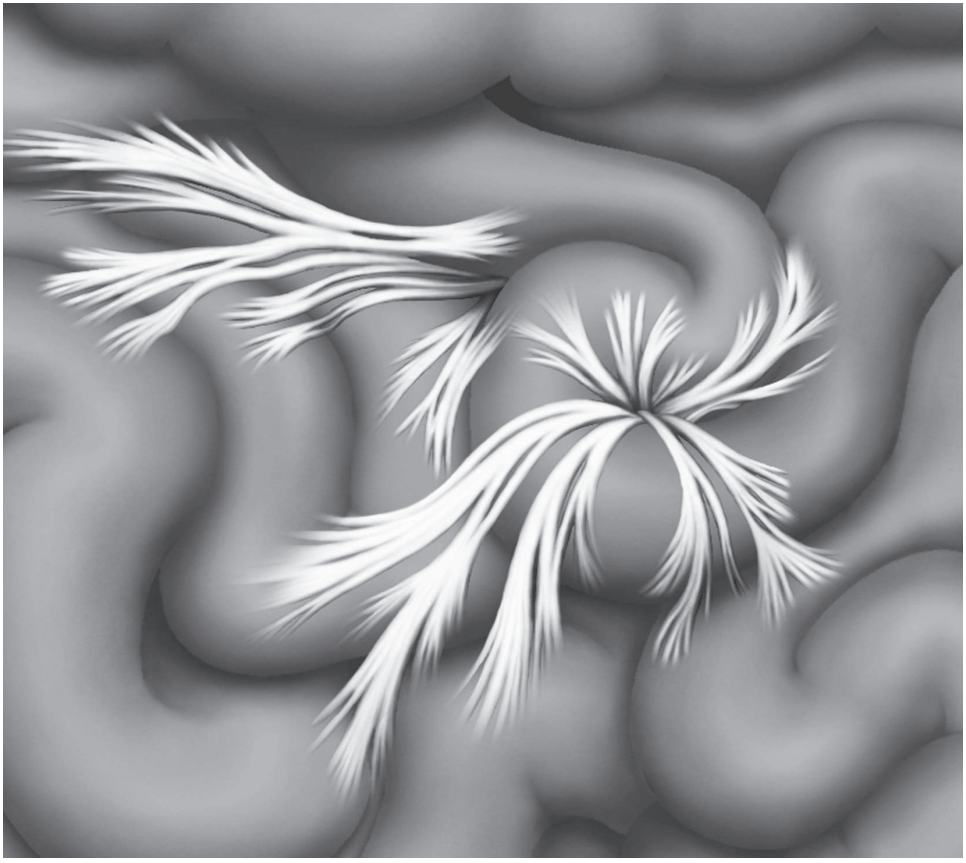
Surgery is a major cause of adhesion formation

Unfortunately, surgery is also a major cause of adhesion formation; adhesions are one of the most common side effects of surgery. No matter how skilled a surgeon, the body lays down adhesive cross-links to help the body heal from the surgery, just as it would from any other trauma.

Numerous methods and devices have been developed to slow or lessen the adverse affects of post-surgical adhesions. But despite surgeons' best efforts and the advances of modern medicine, post-surgical adhesions are a vexing problem that continue to complicate the lives of patients who undergo abdominal and pelvic surgeries. We discuss post-surgical adhesion formation and pain extensively in Chapter Sixteen.

Radiation therapy

Designed to kill cancer cells, radiation therapy also kills some surrounding healthy living tissue. Like surgery, radiation therapy can be a valuable, life-saving technique. But the process of irradiating a tumor can create severe tissue damage and massive adhesion formation at the site of the tumor, and in nearby, previously healthy tissue. Adhesions can bind organs together, severely restrict mobility and function, and cause pain, digestive conditions, or other problems.

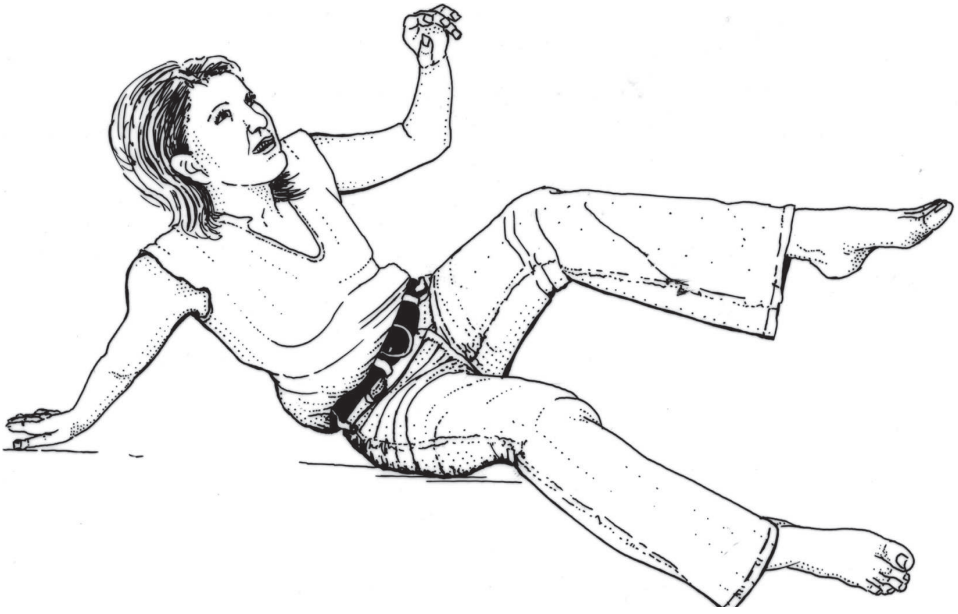


Used to treat cancer, radiation therapy can cause massive adhesion formation, depicted here in the intestines.

Adhesions from radiation therapy to the abdomen or pelvis can become life-threatening when they obstruct the bowel, causing the delicate tissues of the intestines to become restricted, twisted, or closed due to adhesive straight-jackets. While oncologists and radiologists continue to develop ways to shield and protect healthy tissues from its deleterious effects, radiation therapy remains a major cause of adhesions, with resulting pain or dysfunction.

Trauma

As seen in the example at the beginning of this chapter, a fall at a young age can cause adhesions with long-term deleterious effects later in life. Early life traumas such as falls onto the hip, tailbone, chest, or head can create strong glue-like adhesions at the site of tissue injury.



Falls and traumas cause adhesions to form at the site of tissue impact. These adhesions may spread to other areas over time.

As the body grows, adhesions do not always stretch along with the nearby growing structures. Thus, the adhesions can create a pull into muscles, nerves, organs, and support structures during youth and into adulthood. This pull can continue through life, creating internal bonds from which some tissues never escape.

During the school years, athletic injuries from falls or sporting events can create more adhesions. And so it goes through life, as trauma

(whether minor or severe) often adds to the adhesive straight-jackets that grow wherever the body heals.

Abuse

Physical and sexual abuse are too prevalent in the world. The trauma of abuse can tear or chafe delicate tissues at the entrance, or deep within the vagina, rectum, face, or elsewhere in the body. Trauma leads to inflammation, and the body responds by laying down adhesive cross-links to contain, protect, and isolate the injured area. The affected tissues can remain adhered thereafter for life, unless treated by a knowledgeable soft-tissue therapist, or removed by a surgeon.

The body's emotional response to sexual or physical abuse is often as tangible as the physical response. The body's compensatory postures of guarding against an imminent threat can create recurrent spasm, eventually leading to inflammation and adhered tissues in the affected areas. The consequent decreases in mobility and function can last for years or decades beyond the original abuse.

We have witnessed the effects of physical and sexual abuse, not just in the areas that were directly traumatized, but also in areas such as the neck, shoulders, low back, hips, and legs as the survivor's body reacted to a terrible situation by creating a pattern of guarding and muscle spasm in areas that were physically, mentally, or emotionally affected by the abuse.

Auto accidents

Motor vehicle accidents (especially sudden acceleration from or deceleration to a total stop) are significant causes of adhesion formation in the body. Since the body may brace for a sudden, oncoming change, the muscles are often tense when the trauma occurs, increasing the shock and degree of injury from the impact.

As the force of the impact travels through the car into the driver or passenger, the various soft tissues of the body absorb the trauma or

whiplash. Solid organs like the kidneys, liver, brain, and spleen lack pliability, so they tend to absorb the trauma of the impact immediately. Stretched beyond their normal anatomy, the ligaments and support attachments experience micro-tears as they attempt to contain organs that have been violently jarred from their normal anatomical positions.

Following trauma, injured areas become inflamed. Tiny cross-links form at the areas of trauma to contain the damage and start the healing process. Depending on the extent of the inflammation, cross-links may spread to neighboring structures, increasing the geographic impact of the trauma within the body. Wherever they develop, adhesive straight-jackets begin to form as a response to the injury.

How Adhesions Impact the Body

Many people notice the pull of adhesions as decreased range of motion, or pulls from the many areas of the body. Initially this may feel like a dull pain or ache in these areas that continues or increases over time.

Adhesions create problems when they:

- Put pressure on pain-sensitive tissues or other structures
- Pull on nerves causing pain
- Glue structures that should be mobile, causing dysfunction.

Depending on where and how adhesions form, people experience the pull of adhesions in different ways. Some people are totally asymptomatic – there is virtually no sensation of pain or pulling in the body. These people may never know they have adhesions until they note decreased function (such as infertility or digestive problems) or undergo a diagnostic test such as a laparoscopy or HSG dye test that shows problems.

In fact, we have examined people with severe tightness, adhesions, and spasm in their necks, upper shoulders, or back with no complaint of pain or discomfort in those areas.

For some people, this tightness may manifest itself further up or down the line with TMJ (jaw pain) or other problems in the head, face, and jaw. Some have difficulty turning their head and shoulders to full range – for example to look out the rear window when backing up a car. Because a physician cannot diagnose adhesions without surgery, many people do not realize they have developed them, nor understand the impact that adhesions may be creating on their comfort or quality of life.

When nerves or pain-sensitive structures become bound by adhesions, the result is pain. Adhered organs and muscles become inefficient, ineffective, or unable to properly do the job for which they were designed when their normal ability to move over and around each other becomes restricted. Eventually, they can stop working altogether, as the adhesive glue slowly shuts down their ability to function. As tissues become adhered, they can exert significant force or pull on other structures, creating pain and dysfunction in remote areas.