Low Back Pain

by David Borenstein, MD

Low back pain is the second most common affliction affecting mankind — only the common cold affects more people. More than three quarters of the world's population will have a back problem at some point. This means that you are more likely than not to experience back pain in your lifetime. In most cases, back pain goes away over time. About half the time, it goes away in about a week, and in 90% of cases, it resolves within two months. But in the remaining cases, the pain can last for months after that first backache sets in.

There are ways to relieve this pain and get better. But before that can happen, it is important to know exactly what is causing your pain. The common causes of back pain affect different parts of the spine in different ways. Your specific symptoms, the physical limitations they cause, and the best treatments will depend on the part of the spine that is damaged and the particular cause of the damage.

This article will help you understand some of the most common sources of back pain and what treatments are available for them. But first we need to return to biology class and review the basic anatomy of the spine.

Spine anatomy 101

The spine is divided into five regions, which are, from top to bottom, the cervical spine, thoracic spine, lumbar spine, sacrum, and coccyx. The cervical spine is at the top of the back and connects with the base of the skull, the thoracic spine is in the middle back, and the lumbar spine is in the lower back. These three sections make up what is commonly considered the main part of the spine. The sacrum connects with the bottom of the lumbar spine and sits between the hip bones. The coccyx is below the sacrum and is also known as the tailbone. (See a diagram of the spine.)

Vertebrae. The cervical, thoracic, and lumbar sections of the spine are made up of bones called vertebrae (a single such bone is called a vertebra). The cervical spine has 7 vertebrae, the thoracic spine has 12, and the lumbar spine has 5. Each vertebra is a complex bone composed of a weight-bearing round body and an arch. When the vertebrae are stacked on top of one another, the arches create a vertical column with a central channel known as the spinal canal. In addition, the upper and lower parts of each vertebra's arch form facet joints with the vertebrae above and below. Facet joints help guide the movement of the spine. (See an illustration of a facet joint.)

Intervertebral disks. The vertebrae are separated from one another by intervertebral disks that act as cushions between the vertebrae. They also function as universal joints allowing motion in all directions.

Disks are made of a tough outer fibrous layer called the annulus fibrosus (or just the annulus) and a gel center called the nucleus pulposus. The annulus consists of layers of fibers that run in opposite directions, allowing the disk to contract and expand like a Chinese finger trap. The nucleus pulposus can move forward, backward, or side to side within the annulus. In this way, the gel counteracts the motion of the spine, easing spinal movement. It also serves as a tremendous shock absorber.

The spinal cord. The spinal cord is the large bundle of nerves that connects the brain with the rest of the body. Protected by the spinal canal, it extends down the spine to the first (highest) lumbar vertebra. Within the spine, many smaller spinal nerves branch off from the spinal cord and exit the spinal canal through openings in the vertebrae known as neural foramina. Each of these spinal nerves contains fibers that supply sensation to different parts of the body and sends signals to muscles, telling them to contract and relax. For example, one spinal nerve supplies each facet joint; another supplies the muscles and skin over the back; and another gives sensation to the bones, muscles, and skin of the leg on one side of the body. Back muscles. Finally, there are many muscles in the back that play a key role in the movement of the spine and in maintaining normal posture. The largest back muscle — though not the strongest — runs down the back of the spine from the base of the skull to the sacrum and pulls the spine backward and to the side. Smaller muscles under this large muscle run between the vertebrae and allow the spine to twist and bend to the side. A muscle in the front of the spine connects the lumbar spine and the thighbone. This muscle bends the spine forward and is activated when you bend over. Covering all the muscles of the lower back is a membrane called fascia, which resembles plastic wrap and is located just below the skin. The fascia improves the function of the contracting muscles, but just like the muscles it surrounds, it is at risk of being stretched or torn and becoming a source of pain.

In short, the spine is a beautifully engineered structure. It allows for a tremendous variety of physical activity while protecting its essential parts, such as the spinal cord. Back pain occurs when one or more of the many parts of the spine are damaged or worn out. Finding out which part is damaged can help in choosing the best therapy.

What's causing my low back pain?

Disorders of the lumbar spine are the most common causes of low back pain. These disorders are often related to injury, overuse, or deformity of a spinal structure, and they can occur in the muscles, intervertebral disks, facet joints, or spinal nerves. Damage to these structures is often the result of aging, but different parts of the spine tend to get damaged at different times in your life. That is why you may have muscle problems when you are 20–40 years old, and then have difficulties with your spinal nerves when you are 60 or older.

The aging process that results in spinal problems actually starts fairly early in life. In your 20's, the blood flow to the intervertebral disks starts to decrease, impairing the function of the cartilage cells within the disks. In addition, factors such as obesity, smoking, and strenuous physical activity increase your risk of developing low back pain. The following sections review some of the most common causes of low back pain: muscle strains and spasms, herniated disks, and spinal osteoarthritis (OA).

Muscle strains and spasms

The common condition "back strain" refers to an injury to the muscles or fascia. Muscle strains in the lumbar spine are common. You can sneeze or cough and develop one. Lifting an object too heavy for your

muscles to support can also strain a lower-back muscle. When a muscle is damaged, the brain sends a reflex signal through the spinal cord. The signal tells the damaged muscle to contract to try to heal itself. In addition, signals are sent to surrounding muscles to protect the injured muscle. This response is what causes muscle spasms. Although the severity of spasms can vary, the pain can be overwhelming and even immobilizing. People with back spasms may have difficulty getting out of bed or putting on their clothes because the pain is so severe and the muscles are so stiff.

Doctors diagnose a muscle strain after considering how the injury came about, whether the mobility of the spine is decreased, and whether there is evidence that the muscles are contracted. Many people think that their muscle is "swollen" when it is actually severely contracted. X-rays and other laboratory tests are not useful in making a diagnosis of muscle strain.

The best way to relieve muscle spasms caused by muscle strain is to keep moving. Gradual movement and stretching relieve spasms and allow the muscles to continuously test how far they can stretch. In addition to motion, nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen (Advil), cold packs for pain relief, and heating pads to increase blood flow are all part of an effective self-management program to relieve back pain caused by muscle strain. As the pain begins to go away, you will find that the original site of the injury is the last remaining painful spot.

Intervertebral disk herniation

A herniated intervertebral disk occurs when the outer layer of the disk — the annulus — starts to wear out. When the crisscross of fibers that make up that layer breaks, the gel inside escapes. A disk protrusion, or bulging, occurs when the escaped gel remains within the outermost wall of the annulus, and a disk extrusion, or herniation, occurs when the gel escapes the annulus entirely and enters the spinal canal. A disk herniation is commonly known as a "slipped disk," but the disk does not really slip. Herniated disks are most common in people aged 30–40. (See an illustration of a herniated disk.)

Herniated disks cause pain if the gel comes into contact with spinal nerves. This can happen either in the spinal canal or in the neural foramina through which smaller nerves pass as they branch off from the spinal canal. When the gel comes into contact with nerves, the body considers the gel a foreign substance and tries to remove it by sending inflammatory cells and enzymes to dissolve it. This becomes a problem when the inflammation-causing substances attack the neighboring spinal nerves. When a spinal nerve is inflamed, the result can be leg pain and numbness.

Any disk in the lumbar spine can herniate, but herniation is most common in the three lower disks of the lumbar spine. These disks carry a greater proportion of the weight of the body. Which disk herniates can affect symptoms because each spinal nerve travels to a different portion of the leg or foot. For example, inflammation of the lowest lumbar spinal nerve causes numbness in the front of your lower leg and the big toe, weakness in the big toe, and an inability to raise your foot on your heel (a condition known as foot drop) — but no loss of reflex. On the other hand, inflammation of the first spinal nerve in the sacrum causes numbness in the calf and the fourth and fifth toes, weakness when you are standing on your toes, and loss of the ankle reflex. (To test your ankle reflex, a doctor or nurse taps your Achilles tendon at the back of your foot and sees whether the foot moves in a downward direction.)

People with a disk problem may have mild back pain at the site of the herniation. The pain may be more intense when they are sitting, driving, coughing, or having a bowel movement, since these activities increase

pressure on the herniated disk. Often, the most serious symptom is a condition known as sciatica, which causes a deep and sharp leg pain that may be accompanied by “pins and needles” tingling. The affected leg may feel weak, and the pain may vary in intensity but can be serious enough to make you unable to move.

A doctor who suspects that you have a herniated disk will want to take tests to confirm a diagnosis. The most useful test is a magnetic resonance imaging (MRI) scan, which can pinpoint the location of a herniated disk. (A standard x-ray cannot.)

Once your doctor has diagnosed you with a herniated disk, do you need surgery? For most people, the answer is no. Over 80% of people with a herniated disk can recover without surgery. Although it may take several months, the gel can be absorbed back into the disk and the nerve can return to normal functioning.

For this to happen, though, you need to manage your symptoms carefully. The most important management tool is gradual movement. Being up and about as much as possible has been shown to bring about a more rapid improvement in symptoms than staying in bed. Moving allows the spine to heal while avoiding the loss of muscle strength that occurs with prolonged bed rest. Physical therapy can help some people improve strength and flexibility and learn postures and positions that do not worsen the pain.

Drug therapy is also important and can include an NSAID, a muscle relaxant such as cyclobenzaprine (Flexeril) or orphenadrine (Norflex), and an analgesic such as tramadol (Ultram). These medicines can reduce inflammation surrounding the disk and nerve, thereby relieving pain. Muscle relaxants are able to diminish the severity of spinal muscle contraction that occurs in conjunction with nerve injury. Analgesics — both opioids and nonopioids — are used to decrease pain and allow you to move, thereby helping the disk heal.

An epidural injection is another treatment option. You probably know that epidural injections are sometimes used to ease pain in women giving birth. In these cases, the injected drug is an anesthetic that numbs the lower half of the body. For people with sciatica, however, the medicine used is an anti-inflammatory corticosteroid. The epidural injection is given into the space surrounding the nerves in the spine, allowing the corticosteroid to target the specific area of nerve inflammation. A series of three epidural corticosteroid injections may be given over a six-week period to treat the symptoms of sciatica.

In very rare circumstances, an unusually large disk herniation affects several spinal nerves, including those that supply the bladder and rectum. People to whom this occurs are at risk for incontinence and require emergency surgery to remove part of the herniated disk and relieve pressure on the spinal nerves. Also, if a person is experiencing muscle weakness in the leg or foot that is growing progressively worse, spinal surgery may be required. An important point to remember, however, is that disk surgery treats leg pain, not back pain. A successful disk surgery can bring about rapid improvement of leg pain and gradual relief of leg numbness.

Disk degeneration and OA

Another problem that can affect the spine is degeneration of the intervertebral disks, which can lead to OA in the facet joints. Intervertebral disks start losing water when you are in your 30’s. When disks lose water, they lose their ability to act as cushions between the vertebrae, and the spaces between the vertebrae narrow. Losing space between the vertebrae causes more pressure to be placed on the facet joints in the spinal arch. Facet joints normally guide motion and are not meant to bear weight. And as with most joints, the ends of

the bones that meet to form the facet joints are lined with smooth and slippery cartilage. When increased pressure is placed upon facet joints, the cartilage starts to wear out and the bones can rub together, potentially causing stiffness and pain. This is known as OA. People over 50 are at greater risk for OA of the lumbar spine.

In some cases, the flattening of disks and the narrowing of facet joints that occur in spinal OA are painless, but in others they cause severe pain focused in a particular area of the back. It is not known exactly why certain facet joints become more painful than others. Typically, the back pain caused by spinal OA is worse when you are standing, bending backward, or lying flat on your back with your legs straight. Pain may radiate across the back and down into the buttocks, but it does not typically radiate into the legs. Standard x-rays and MRIs can detect changes in the disks and joints, but they are unable to detect the presence or location of pain.

There are many effective ways to manage spinal OA. Because obesity can negatively affect the functioning of the spine, losing weight can help relieve back symptoms. It is not clear whether obesity raises the risk for low back pain, but it is clear that once someone has back pain, being overweight does not help. Losing weight results in less pressure on the spine, relieving strain on the facet joints. In addition, physical therapy and a regular exercise program can strengthen the muscles in front of the spine, including the abdominal muscles, helping to relieve the OA pain.

Many pain-relieving medicines can also be effective for treating pain related to spinal OA. These include NSAIDs, analgesics, and muscle relaxants. An increasing concern, however, is that the potential side effects of long-term use of these drugs may outweigh their benefits as you grow older. Of particular concern is the risk of gastrointestinal bleeding or high blood pressure that can occur with the prolonged use of NSAIDs.

For people who cannot take pain-relieving drugs because of side effects, a facet joint block is an option. A facet joint block is an injection of a long-acting anesthetic into the affected joint. If you and your doctor decide on a facet joint block, the first step is to identify the joint that is causing the pain. Bending the lumbar spine backward and to the painful side frequently identifies the offending joint. The area will also be tender to the touch. If these tests don't work, a physician can identify the painful facet joint with special x-ray techniques. Facet joint blocks decrease pain so that you can exercise, lose weight, and reduce your risk of persistent back discomfort.

Another cause of back and leg pain is lumbar spinal stenosis, which occurs in people aged 60 or older and is very common. I take up the subject of lumbar spinal stenosis in another article.

Last Reviewed on July 27, 2011

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