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Marcia K. Anderson

Bridgewater State College, mkanderson@bridgew.edu

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LOW BACK PATHOLOGY or "Oh My Aching Back!!"

Marcia K. Anderson

An estimated 60 to 80 percent of the American population experiences low back pain at one time or another. Although this condition typically strikes individuals between the ages of 25 and 60 years, with frequency peaking at about age 40, it also occurs in as many as 25 percent of adolescents and children, ranging down to age 10. Despite thinking to the contrary, males and females appear to be equally susceptible. Low back pain is often associated with lumbar disc degeneration or irritation of the sciatic nerve (sciatica), but may also be of unknown origin, referred to as low back syndrome (LBS). This article will discuss the three main causes of low back pain, identify common symptoms that indicate medical referral is necessary, and will provide preventive measures to reduce the incidence of low back pain.

LUMBAR DISC INJURIES

Fibrocartilaginous discs provide cushioning between the vertebral bodies that make up the spinal column. In the intervertebral disc, a thick ring of fibrous cartilage, the annulus fibrosus, surrounds a gelatinous material known as the nucleus pulposus. The discs serve as shock absorbers and also allow the spine to bend.

Because the discs are avascular, they receive no blood supply. Instead, the discs must rely upon changes in posture and body position to produce a pumping ac-

tion to bring in nutrients and flush out metabolic waste products. Because maintaining a fixed body position curtails this pumping action, sitting in one position for a long period of time can negatively affect disc health.

Long term mechanical loading of the spine can lead to microruptures in the outer portion of the disc, which in turn, can lead to degeneration. A bulging, or protruded, disc refers to some damage to the nucleus with slight deformity of the annulus. When the nucleus produces a definite deformity, however, and works its way through the fibers of the annulus, it is called a prolapsed disc. As the degeneration continues, the disc material moves into the spinal canal and runs the risk of impinging adjacent nerve roots. When this occurs the condition is called an extruded disc, and may produce radiating pain down the nerve root that is impinged. Finally, with ultimate degeneration, the nuclear material separates from the disc itself and can potentially migrate. The most commonly herniated discs are the lower two lumbar discs between the L4-L5 vertebrae and L5-S1 vertebrae, with most ruptures moving posterior or posterolateral.

Because the intervertebral discs are not innervated by nerves, damage to the disc does not, in and of itself, result in the sensation of pain. Sensory nerves supply the longitudinal ligaments that surround the vertebral column, the vertebral bodies themselves, and the articular cartilage in the facet joints. Impingement on one of these structures, the spinal cord, or a spinal nerve is what produces the sensory and motor changes. For example, when compression is placed on a spinal nerve that makes up the sciatic nerve complex (L4-S3), sensory and motor deficits are reflected in the muscles and skin associated with that nerve root. A disc need not be completely herniated to give symptoms.



Figure 1. Straight Leg Raising Test

Symptoms of a disc herniation may include severe local pain and muscle spasms at the site of the herniation, as well as radiating pain or numbness down the sciatic nerve into the lower extremity. The individual may walk in a slightly crouched position leaning away from the side of the lesion. This position relieves some of the compression on the nerve root. Forward trunk flexion or a straight leg raising test (Figure 1) may exacerbate pain and increase symptoms. Significant signs indicating the need for immediate referral to a physician include muscle weakness, sensory changes, such as numbness or tingling, diminished reflexes in the lower extremity, and abnormal bladder or bowel function.

Treatment depends on the severity of symptoms, type of activity the individual is involved in, occupation, and normal daily activities participated in. In mild cases, treatment consists of minimizing load on the spine. This includes avoiding activities that involve impact, lifting, bending, twisting, and prolonged sitting and standing, because these increase pressure on the discs. Jogging and physical activity is allowed if it does not increase the symptoms. Because unexplained contraction of the muscles at the site of a back injury is a common occurrence, painful muscle spasm, knots, and tightness must be eliminated. A variety of approaches can

be used including ice and/or heat, administration of prescribed nonsteroidal anti-inflammatory drugs (NSAIDs) and/or muscle relaxants, passive exercise, and gentle stretching. Depending on severity, the back should also be rested with strenuous activity prohibited. Although recovery from symptoms may take several months, surgery is generally not warranted except in severe cases when significant neurological deficits are noted.

Following resolution of spasm and acute pain, rehabilitation is initiated that focuses on restoring or improving spine and hamstring flexibility, and abdominal and posterior trunk muscle strength. More often than not, one or more of these areas of function is below average in an individual with low back pain. Individuals should not assume body positions or undertake movements during daily living activities that are potentially injurious.

SCIATICA

Sciatica is an inflammatory condition of the sciatic nerve that may result from a herniated disc, annular tear in the disc, muscle-related disease, spinal stenosis (narrowing of the vertebral canal), facet joint arthropathy, or compression of the nerve between the two parts of the piriformis muscle. If related to a herniated disc, radiating leg pain is greater than back pain, and increases with sitting and leaning forward, coughing, sneezing, and straining. Pain is reproduced during a straight leg raising test (Figure 1). With annular tears, back pain is more prevalent and exacerbated with straight leg raising. In a muscle-related problem, a common complaint is morning pain and muscular stiffness that worsens if chilled or when weather changes (arthritis-like symptoms). Pain typically radiates into the buttock and thigh region. If narrowing of the lumbar vertebral canal, or spinal stenosis, is present, back and leg pain develops after the individual walks a limited distance and concomitantly increases as distance increases. Pain is not reproduced with a straight leg raising test. Facet-joint arthropathy produces localized pain over the joint when an individual lean backwards

or to the side. Should the sciatic nerve be compressed between the two parts of the piriformis muscle, located deep to the gluteus maximus, pain increases when the thigh is rotated toward the midline of the body. In either case, a physician needs to determine the presence of a serious underlying condition.

Under normal circumstances, bed rest is usually not indicated, although side-lying with the knees flexed may relieve symptoms. Lifting, bending, twisting, and prolonged sitting and standing aggravate the condition by increasing disc pressure, and therefore should be avoided. When pain has subsided, abdominal and posterior trunk muscle strengthening exercises can begin with gradual return to normal activity. If symptoms resume, stop activity and revisit the physician. Occasionally, extended rest is needed for symptoms to totally resolve or if a significant disc protrusion is present, surgery may be indicated.

LOW BACK PAIN SYNDROME

Low back pain syndrome, or LBP, has become an increasingly serious medical and socioeconomic problem. It is second only to the common cold as the leading cause of lost work time, and dominates claims for worker's compensation. Furthermore, the condition accounts for 10 percent of all chronic health problems, and is ranked 11th among causes for hospitalization in the United States.

Although several known conditions may cause LBP, most cases are idiopathic, or of unknown origin. Because it is difficult to identify anatomical structures that are the source of pain, it is also difficult to determine what factors may be contributing to the development of pain. There is general agreement, however, that mechanical stress is the primary cause in most LBP cases.

Low back pain is often attributed to improper lifting techniques that place undue stress on the low back vertebrae, intervertebral discs, and ligamentous structures. The condition, however, is also commonly

seen in individuals who participate in running activities and in individuals who sit for extended periods of time. There is a tendency for many runners to have muscle tightness in the hip flexors and hamstrings muscle groups. Tight hip flexors (located on the anterior hip) tend to produce a forward body lean leading to anterior pelvic tilt and hyperlordosis of the lumbar spine. This, coupled with tight hamstrings can lead to a shorter stride, and produce a shearing force on the low back region.

This mechanism is somewhat duplicated in individuals who sit for extended periods of time. In sitting, the knees are bent, the hamstrings are relaxed and shortened, and the individual leans forward to work at a desk. The combination of these actions, coupled with the tendency to slouch in the chair, lead to an anterior pelvic tilt that produces a shearing force on the low back region. The end result is chronic low back pain and discomfort.

STRAIGHT LEG RAISING TEST

The most common test used to identify the source of low back pain is the straight leg raising test (Figure 1). The individual is placed in a relaxed supine position with the knee extended. The individual's heel is placed in one hand while the other hand is placed on top of the patella to prevent the knee from flexing. The leg is slowly raised until pain or tightness is felt, then slightly lowered until the pain is relieved. The individual is then asked to flex the neck onto the chest, or dorsiflex the foot, or do both actions simultaneously. Increased pain with neck flexion or dorsiflexion indicates a possible sciatic problem. Pain that occurs opposite the leg lifted indicates a possible herniated disc. No increase in pain with neck flexion or dorsiflexion indicates tight hamstrings. Although this test can be done in the privacy of your home, it is not designed for self diagnosis. If pain, muscle weakness, and sensory changes are present, consult your personal physician immediately for more detailed evaluation and treatment.

PREVENTING LOW BACK PAIN

Daily exercises are the key to preventing low back pain. These exercises should focus on developing strength in the abdominals and posterior trunk musculature. Flexibility in the hamstrings and low back region is also critical. Exercises can be performed early in the morning while still lying in bed. In addition to exercise, several techniques can be adapted into your activities of daily living to reduce stress on the low back region, and are listed below. Despite exercise and healthful living, low back pain may still occur. Keep in mind that if pain, muscle weakness, muscle spasms, or sensory changes exist for more than a few days, consult your personal physician.

PREVENTING LOW BACK INJURIES

SITTING

*Sit on a firm, straight-back chair, and avoid slouching.

*Sit with the feet flat on the floor.

*Avoid sitting for long periods of time, particularly with the knees fully extended.

DRIVING

*Place the seat forward so the knees are level with the hips and you do not have to reach for the pedals.

*If the left foot is not working the pedals, place it flat on the floor.

*Avoid leaning forward or slouching.

*Keep the back of the seat in a nearly upright position.

STANDING

*If you must stand in one area for an extended time, shift position from one foot to the other, or place one foot on an elevated piece of furniture to keep the knees slightly bent.

*Concentrate on holding the chin up, keeping the shoulders back, and relaxing the knees.

LIFTING AND CARRYING

*Avoid lifting heavy objects without a lumbosacral belt or assistance.

*To lift an object, place the object close to the body. Bend at the knees, not the waist, and keep the back erect. Tighten the abdominal muscles and breath normally. Do not hold your breath. Do not twist while lifting.

*To carry a heavy object, hold the object close to the body at waist level and carry the object in the middle of the body not to one side.

SLEEPING

*Sleep on a firm mattress. If needed, a sheet of 3/4 inch plywood can be placed under the mattress.

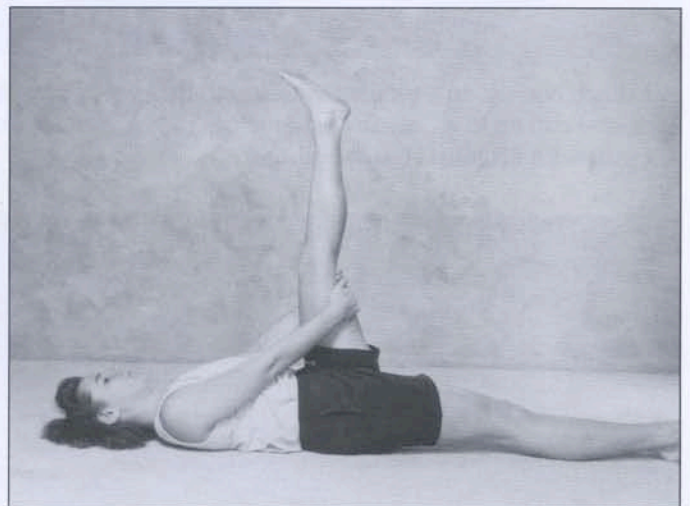
*Sleep on your side and place pillows between the legs. If you sleep supine, place pillows under the knees. Avoid sleeping in the prone position.

*Waterbeds may relieve low back pain since they support the body curves evenly.

EXERCISES TO PREVENT LOW BACK INJURIES



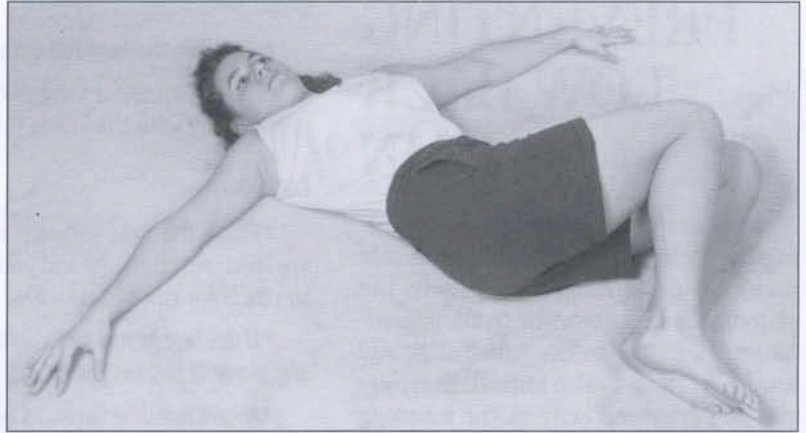
A. Single knee to chest stretch. In a supine position, pull one knee toward the chest with the hands. Keep the back flat. Switch to the opposite leg and repeat. Repeat by bring both knees to the chest.



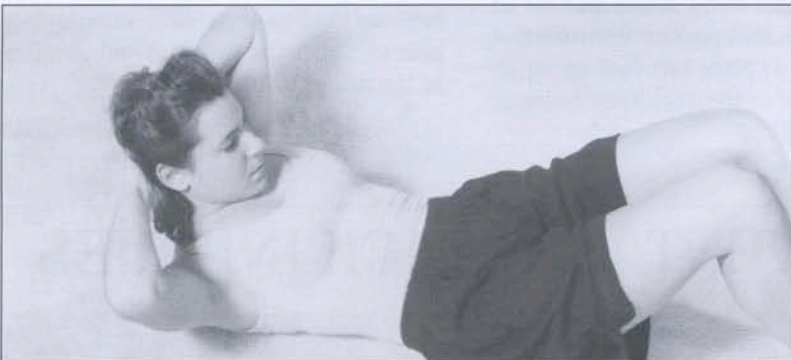
B. Hamstrings stretch. While lying on your back, bring the leg straight up. Use a hand or towel to assist in stretching the muscles. Do not allow the knee to bend.



C. Lateral rotator stretch, seated position. Cross one leg over the thigh and place the elbow on the outside of the knee. Gently stretch the buttock muscles by pushing the flexed knee across the body while keeping the pelvis on the floor.



D. Lower trunk rotation stretch. In a supine position, rotate the flexed knees to one side, keeping the back flat and the feet together.



E. Crunch curl-up. In a supine position with the knees flexed, flatten the back, and curl up to elevate the head and shoulders from the floor. Alternate with diagonal crunch curl-ups.



F. Alternate arm and leg on all fours. While on all fours, raise one leg behind the body while raising the opposite arm in front of the body. Ankle and wrist weights may be added for additional resistance.



Marcia K. Anderson is Professor of Physical Education and Director of the Athletic Training Program.

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