Case reports

Diagnosis and treatment of severe dysplastic spondylolisthesis

LOUIS D. LEONE, DO, FOASM
DAVID W. LAMONT, BS, MS IV

Spondylolisthesis, the anterior or posterior displacement of one vertebra on another, usually affects the lumbar region. Five percent of the population has one of the five classes of spondylolisthesis, which include dysplastic, isthmic, degenerative, traumatic, and pathologic spondylolisthesis. This article focuses on the dysplastic type, which makes up 14% to 21% of all spondylolisthesis. Dysplastic spondylolisthesis usually causes no symptoms in children; pain usually begins in adolescence. The key to diagnosis is the appropriate use of radiography in the evaluation of low back pain. This report describes a case involving a 21-year-old woman presenting with back pain to the family physician. Also, it details how the diagnosis was achieved and evaluates conservative and aggressive treatment options.

(Key words: Spondylolisthesis, back pain, spondylolysis)

Impairments of the back and spine are frequent challenges facing physicians today. In fact, it is estimated that up to 80% of the population is affected by back pain at some point in life. The challenge for the primary care physician is to detect the more serious conditions and differentiate them from the strains and sprains and the malingering.

Spondylolisthesis, defined as an anterior or posterior displacement of one vertebra on another, is one condition that may require orthopedic consultation and surgical intervention. Spondylitis is the chronic deterioration of the intervertebral disk. Spondylolysis is a defect in the pars interarticularis, or isthmus, of the vertebra.

The report of the vertebral arch between the superior and inferior facets.

There are five types of spondylolisthesis.2 Dysplastic spondylolisthesis results from congenital abnormalities of the upper sacral facets or inferior facets of the fifth lumbar vertebra. No pars interarticularis defect is present. In isthmic spondylolisthesis, a defect in the pars interarticularis is present that allows forward slipping of the fifth lumbar vertebra on the first sacral vertebra. Degenerative spondylolisthesis results from intersegmental instability of long duration and is six times more likely to occur between the fourth and fifth lumbar vertebrae. Traumatic spondylolisthesis occurs in response to fractures in areas of the bony hook other than the pars interarticularis. Pathologic spondylolisthesis is an extremely rare slippage that is a consequence of generalized or localized bone disease.

Report of case
A 21-year-old white woman reported to the family practice office with the chief complaint of back pain of 8 years' duration worsening in the past 2 weeks. The patient denied any history of trauma or injury and had never been seen by a physician or treated for the back pain previously. She indicated that the pain was in the lower back region and was worse with walking. She noted weakness; pain shooting into the lower extremities was also noted.

This patient was a para 2, gravida 2 mother who had undergone a cesarean delivery of her second child 2 months earlier. The family history is significant for an aunt and a cousin with multiple sclerosis. In addition, the patient's mother had spina bifida, and her father had a history of herniated lumbar disks. She denied the use of any medication, previous injuries, hospitalizations, or history of ongoing medical illness. She is currently unemployed and has smoked a pack of cigarettes a day since age 8.

The physical examination revealed an alert and oriented young woman in moderate distress secondary to pain. While the patient was standing, tenderness to palpation was elicited bilaterally from the region of the 10th thoracic to the 1st sacral vertebrae. Hypertonicity was also noted from the first to the fifth lumbar paravertebral musculature. Bilateral muscular weakness in the lower extremities was identified as +4/5. Active motion of the spine was limited in flexion and extension. The straight leg raising test was positive on the left.

Lumbosacral strain with radiculopathy was diagnosed, and treatment was initiated with an intramuscular injection of 60 mg of ketorolac tromethamine (Toradol) and 10-mg tablets for pain as needed. In addition, a prescription of cyclobenzaprine hydrochloride (Flexeril), 10 mg by mouth three times a day, was given with a recommendation of moist heat four times a day for 20 minutes at a time. The patient was instructed to return to the office in 1 week.

Seven days later, the patient returned with new complaints of upper extremity weakness and occasional pains in her forearms, which were later attributed to bilateral carpal tunnel syndrome. She also noted little improvement of the back pain, and the analgesics had been of no value.
Physical examination revealed her to be visibly anxious. The straight leg raising test was positive bilaterally at 20 degrees of hip flexion. She undertook all movements with visible apprehension and limited range of motion. At this time, determinations of complete blood cell count, thyroid-stimulating hormone level, and basal metabolic profile were ordered to rule out medical etiologies. The patient was unable to remain still because of her pain, so radiographs of the lumbosacral region were inconclusive. The patient was given propoxyphene napsylate/acetaminophen (Darvocet) tablets for pain. She also was instructed to have the laboratory tests completed and to return in a few days to review the results.

On her third visit 1 week later, the patient said that the pain was getting worse; she had shooting pains and paresthesia in her calves at times, along with increasing weakness. The results of all laboratory studies were within the normal range. The napsylate/acetaminophen was making the patient nauseated, and she discontinued its use. Examination showed her to have bilateral lower extremity weakness with foot dorsiflexion and planatar flexion, leg extension, and hip flexion. At this time a magnetic resonance imaging (MRI) study was ordered to rule out multiple sclerosis and a lumbar disk pathologic lesion, and she was referred to the orthopedic department. The MRI study showed a total grade IV dysplastic spondylolisthesis of the fifth lumbar vertebra on the first sacral vertebra, with the lumbar spine completely anterior with respect to the sacrum (Figure). There was also a bulging disk at L5-S1. The MRI study was negative for multiple sclerosis. The patient was referred to an orthopedic surgeon for evaluation and treatment.

Discussion
Dysplastic spondylolisthesis is caused by a congenital deficiency of the superior sacral facets, inferior fifth lumbar facets, or both, with gradual slipping of the fifth lumbar vertebral body forward on the sacrum. The fifth lumbar facets appear to subluxate ventrally on the sacral facets. The pars interarticularis elongates or attenuates as progression occurs over time. Because the neural arch is intact, this type often encroaches on the cauda equina, causing back and leg pain.

The prevalence of spondylolisthesis in the general population is approximately 5%, with dysplastic varieties making up 14% to 21% of all spondylolisthesis. Persons with dysplastic spondylolisthesis have a high incidence of first-degree relatives with the condition (up to 33%), which suggests a genetic influence. There is a strong association with spina bifida occulta. In addition, dysplastic spondylolisthesis is two times more likely to occur in females. It is interesting to note that 50% of Eskimos are reported to have spondylolisthesis. Increased slippage, if it occurs, usually happens between the ages of 9 and 15 years.

Spondylolisthesis usually causes no symptoms in children; pain usually begins in adolescence. The pain most often begins with a growth spurt and is predominantly a backache, with occasional leg pain related to irritation of the fifth lumbar nerve root. Symptoms are aggravated by activity and competitive sports, with pain diminishing at rest. Children, unlike adults, seldom have objective signs of nerve root compression. Tight hamstring, evident with the straight leg raising test, are often the only physical sign. Scoliosis is also a relatively common finding in younger persons with spondylolisthesis. With severe spondylolisthesis, spinal process step-off due to anterior vertebral displacement may also be noted. Eventually, loss of distal reflexes from cauda equina and root compression may develop.

As the spondylolisthesis progresses, the person assumes a lordotic posture to compensate, with the buttocks becoming heart shaped because of sacral prominence. The person usually has a peculiar spastic gait known as the "pelvic waddle" because of hamstring tightness and lumbosacral kyphosis. Therefore, radiography would be indicated in patients with signs of nerve root irritation, tight hamstrings and hip flexors, and flattened buttocks. Paralysis and bladder dysfunction are considered uncommon with dysplastic spondylolisthesis. A contributory factor to the progression of spondylolisthesis is pregnancy, due in part to the reduction in tone of the abdominal muscles and joint laxity from the hormone relaxin. In addition, the stress of increasing abdominal weight may influence the development of degenerative spondylolisthesis during pregnancy.

The key to diagnosis of spondylolisthesis is the use of radiography when a patient has back pain accompanied by signs of nerve root irritation, tight hip flexors and hamstrings, or flattened buttocks. A standing lateral view usually shows the spondylolisthesis. A test using hip rotation can be done when malingerer is suspected. This test is done with the patient standing and holding the hands to the side. With the physician’s hands on the patient’s hips, the torso is passively twisted. The response of back pain is considered inappropriate at less than 30 degrees.
Spondylolisthesis is classified into four categories of severity, depending on the degree of slippage. Slippage is calculated by measuring the ratio between the anteroposterior diameter of the top of the first sacral vertebra and the distance the fifth lumbar has slipped anteriorly: grade I, 25% or less; grade II, 25% to 50%; grade III, 50% to 75%; and grade IV, greater than 75%.

Treatment for spondylolisthesis varies greatly with the grade and clinical presentation of the patient. A patient with a diagnosis of spondylolisthesis of grade II or higher should be referred immediately to an orthopedic specialist, and patients requiring surgery should see an orthopedic spine subspecialist. In the absence of neurologic findings, conservative therapy is the initial treatment modality for all patients. This therapy includes a 3- to 5-day trial of bed rest with pharmacotherapy ranging from nonsteroidal anti-inflammatory drugs to epidural delivered steroids. In addition, osteopathic manipulative treatment using muscle energy and soft tissue massage has been shown to help alleviate pain. Bracing with a lumbar sacral orthosis is also frequently instituted.

Surgery is indicated with failure of conservative therapy to control pain, symptomatic progression of the slippage, or initial presentation with neurologic dysfunction in association with slippages greater than 50%. In general, about 20% of patients with symptomatic spondylolisthesis require surgery. The goal of surgery is to prevent neurologic deficit while allowing maximal recovery from any existing deficit.

Reduction procedures are associated with increased operative time, complications, and reoperations. Controversy exists as to whether reduction should be attempted and, if needed, by what means to attempt it. Reduction of the spondylolisthesis can be accomplished by either open or closed means. Closed reduction via casting with traction and hyperextension allows the abnormal anatomy to accommodate changes over a 4-month period before fusion is performed. Open reduction methods are improving with the advent of the Edward’s modular spinal system, which uses pedicle screws for gradual distraction and posterior translation of the anteriorly displaced fifth lumbar vertebra. The incidence of neurologic complications associated with reduction ranges between 10% and 60%. Therefore, except with high-grade spondylolisthesis reduction, reduction is usually avoided.

Most spondylolisthesis requiring treatment will need some type of fusion procedure. With slippages of less than 50%, most surgeons prefer fixation of the unstable spine by posterolateral fusion between the fifth lumbar vertebra and the sacrum. A successful fusion usually allows the patient to return to moderate activities.

There is some controversy surrounding the treatment of slippages of more than 50%. Operative options include bilateral lateral fusion, anterior fusion, posterior interbody fusion, cast reduction and fusion, and posterior spinal instrumentation with reduction and fusion. In situ bilateral transverse process fusion results in overall clinical improvement in more than 80% of patients. However, despite an increased possibility of complications, combined anterior fusion and reduction with posterior spinal instrumentation may be recommended for high-grade slippages because of problems with the healing of a posteriorarthrodesis alone.

Comment

Low back pain is one of the most common complaints of patients seen by primary care physicians today. In light of the huge number of workers’ compensation and long-term disability claims, it is easy for the practitioner to dismiss low back pain as malingering or to contribute the pain to the patient’s not changing risk factors such as obesity, smoking, poor work habits, and lack of daily exercise. The challenge for physicians today is to evaluate physical signs accompanying back pain while encouraging patients to modify the risk factors that predispose them to chronic low back pain. Physicians need to keep in mind a broad differential diagnosis for back pain in the workup, evaluation, and ordering of tests.

Acknowledgments

David Lamont would like to recognize his parents, William and Karen Lamont, for their support. The authors acknowledge Kevin Finefrock of Wolfe Camera for his technical assistance.

References