The femoral stretching test

A valuable sign in diagnosing upper lumbar disc herniations

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The femoral stretching test was first described in 1918 by Wassermann. Its value in the diagnosis of diabetic femoral neuropathy has been emphasized, but scant attention has been given to its usefulness in patients with upper lumbar nerve root compression. Indeed, this test is not mentioned in any of the large series of reported cases. Whether it is known or appreciated is not clear. We will report several cases, selected to demonstrate its value.

**Description of Test**

Wassermann developed this test in a systematic search for an objective physical sign in soldiers who complained of pain in the anterior thigh and shin when Laségue's sign was absent. Although he showed that testing could be carried out in several positions, it was most sensitive when done as shown in Fig. 1. With the patient prone, the knee was maximally dorsiflexed. Pain was apparent by facial grimacing, loud outcries, and reflex-reaching for the groin area. When malingering was suspected, the patient's face was turned away from the examiner while a second observer looked for signs of pain. The examination was first carried out in the asymptomatic leg, and then suddenly and unexpectedly in the painful one. For the results to be positive, the test should produce pain, usually very severe, in the distribution of the patient's complaints.

The pain is assumed to be caused by stretching an irritable femoral nerve, and would be expected to be positive where there is compression of the L-2, L-3, or L-4 nerve roots, which are its components. The nerve roots exit from the spine well above the intervertebral disc, so that the root leaving the spine through the foramen at the space below a disc herniation is the one implicated. Compression of the root at the same level occurs only if there is an extreme lateral fragment or if it has migrated upward.

The incidence of disc herniations above L-4 is estimated to be about 5%, with declining frequency as the levels ascend. Aronson and Dunsmore found a total of 5.2% in a series of 1395 cases of lumbar disc herniation, Guttermann and Shenkin found 6.1% among 1000 cases, and Pásztor and Szarvas found 5.1% among 2625 cases. In Semmes' series of 1500 cases, there were 29 herniations at L-3, two at L-2, and only one at L-1, for a total incidence of 3.1%. He discouraged myelography in these cases and preferred surgical exploration of L-4 and then L-3 if the lesion was not found.

Typically, the patient with an upper lumbar disc herniation presents with back pain, often following trauma. As the condition progresses, anterior thigh pain and paresthesias are present. Complaints of leg weakness are frequent, especially associated with climbing stairs. Upon examination, there is restriction and pain on back motion, weakness, and sometimes atrophy of the quadriceps muscle can be noted. The ilioptoas muscle may be weak, although this is difficult to test because of pain. The knee jerk is depressed or absent, and there is diminished sensation over various parts of the anterior thigh. The patient's pain...
FIG. 1. The femoral stretching test. With the patient prone, the examiner places a palm at the popliteal fossa as the knee is strongly dorsiflexed. Excruciating pain is produced in the anterior aspect of the thigh and/or back. In this position, hamstring power can be tested. Distinct weakness will usually be found with L-5 or S-1 nerve root lesions.

is dramatically reproduced by the femoral stretch test, although Lasègue’s sign is absent.

Three illustrative cases are presented to demonstrate the usefulness of this test.

Illustrative Case Reports

Case 1

This 51-year-old woman was operated on for a herniated L-4 disc in October, 1980, with good results except for minor backache. On March 8, 1981, while walking, she was suddenly seized with severe pain and muscle spasm of the low back, radiating into the right buttock. Shortly afterward, numbness developed on the medial aspect of the right thigh, followed quickly by pain in this area. The pain was aggravate by coughing and sneezing, weight bearing, and back motion.

In the right leg, there was painless restriction of straight-leg raising, but femoral stretching reproduced the presenting pain. Sensation was diminished on the anteromedial surface of the thigh, the quadriceps muscle was weak, and the patellar reflex depressed. A defect across the body of L-3 was seen on a Pantopaque myelogram (Fig. 2). A hemilaminectomy was performed at this level. The nerve root was compressed by two large fragments of extruded disc material. No opening could be found in the anulus of the L-2 disc, nor of the disc below, so neither was opened.

The patient was immediately relieved of leg pain. Eight months later, femoral stretching caused only minor back pain. There was no sensory impairment, the power of the quadriceps muscle was normal, and the knee reflexes were equal.

Comment

Aronson and Dunsmore found that 12 of their 15 patients with an L-3 disc herniation had had a previous rupture at L-4 or L-5. They suggested that a disc herniation in the lower lumbar region might predispose the patient to have one at a higher level later.

Case 2

This 43-year-old man was first examined in April, 1979, because of chronic low-back pain radiating down the back of his right leg. The pain had persisted since he had suffered a lifting injury some 10 years before. Neurological findings on the right side included questionable depression of the ankle jerk, a normal knee reflex, and mild restriction of straight-leg raising. The femoral stretching test was negative. A Pantopaque myelogram and epidural venogram were normal. The patient’s condition improved with low-back exercises and a change to lighter work.

In April, 1981, his back pain gradually became more severe, and began to radiate into the anterior part of the right thigh. It was intensified by coughing, sneezing, back motions, and weight bearing. On the right side, there was weakness of the quadriceps muscle, reduction of the knee jerk, and diminished sensation over the anterior aspect of the thigh. Straight-leg raising was free and painless, but the femoral stretching test caused the pain of which he com-
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plained. A defect was seen at the L-3 level on a Pantopaque myelogram (Fig. 3). A fragment of extruded disc was removed through a hemilaminectomy, and the disc space was opened and curetted. The patient was relieved of pain, and when he was examined 3 months later, there was no weakness of the quadriceps muscle. The knee jerks were normal and the femoral stretching test was negative.

Comment

This is a fairly typical story for an upper lumbar disc herniation. Whether the patient had had a previous disc protrusion at a lower level predisposing him to the current herniation can only be conjectured.

Case 3

This 61-year-old salesman was seen on February 5, 1979, 3 days after he had misstepped while lifting. He developed slight pain in the low back, gradually increasing, and later radiating into his left buttock and the anterior aspect of the thigh. The pain was a severe ache, not aggravated by coughing or sneezing, but by back motion and weight bearing. The left knee jerk was depressed, but no sensory impairment was discerned. The femoral stretching test was positive. His pain increased in spite of bed rest, traction, and physical therapy.

On February 13, a Pantopaque myelogram was carried out with considerable difficulty because the pain increased when the patient was lying prone. A defect was seen at the L-4 disc level (Fig. 4). He now had marked weakness of his left quadriceps, absent knee jerk, and diminished sensation over the anterior aspect of the thigh. Excruciating pain was produced by the femoral stretching test. At operation, the L-4 disc was found to have mushroomed out over the surface of the adjacent vertebrae. Because of the positive femoral stretching test, the neural foramen was searched with a curved curette, and a large fragment of disc material was raked back into the canal.

The patient was free of leg pain upon awakening, and when he was examined a year later, the femoral stretching test was negative. Power in the quadriceps was normal, there was no sensory loss, but the knee jerk was still depressed.

Comment

A positive femoral stretching test with herniation at the L-4 level is strong evidence of a fragment in the neural foramen more lateral than one would normally explore with the usual "keyhole" exposure. Abdullah, et al., found extreme lateral herniations of the L-4 disc in 10% of their patients with lumbar disc lesions. They stressed that most patients had signs of an upper lumbar root compression, although myelography might be negative; they recommended discography in such cases. Figure 5 is a drawing of an extreme lateral herniation of the L-4 disc in a case in which pain of the anterior aspect of the thigh and a positive femoral stretch test were the outstanding features.
FIG. 4. Case 3. Pantopaque myelogram showing an extreme lateral herniation of the L-4 disc compressing the L-4 root. A hypertrophic facet is seen, but produced no symptoms.

FIG. 5. Drawing of an extreme lateral herniation of the L-4 disc. The cause for the positive femoral stretching test was not found until the facet was removed. Although the patient was freed of thigh pain, a spinal fusion was later required because of continuing backache.

Discussion

Frykholm has made some important observations which may explain why pain caused by nerve root compression does not follow a dermatomal distribution. While operating with local anesthesia on patients with cervical nerve root compression, he selectively stimulated the roots through the open dura. He found that stimulation of the sensory root caused only paresthesias or electric shocks more marked in the distal part of the extremity. On the other hand, stimulation of an irritated motor root reproduced the patient's presenting pain—a deep, boring ache, most severe in the proximal portion of the extremity and associated with tenderness of the affected muscles. Stronger stimulation caused muscle contraction in the same areas. Stimulation of a normal motor root caused contractions but no pain. If the sensory root was blocked with procaine, pain could not be elicited from either root, although muscle contraction could still be obtained from the motor root. The mechanism was not obvious, but Frykholm thought that irritation of the motor root causes some change in the muscle proprioceptors which produces impulses conducted back to the nervous system through the sensory root, interpreted as pain. In short, pain appears to be produced by motor-root irritation while paresthesias arise from the sensory root.

Falconer, et al.,5 observed at operation that the L-5 nerve root moved 2 to 6 mm downward toward the foramen on straight-leg raising. This motion was restricted by disc herniation, and they believed that pain was due to strain, especially angulation, applied to the root. We have dorsiflexed the knee in two patients at operation and found that the L-4 root moved within a 2-mm range. We cannot state with certainty that pain produced by the femoral stretching test is actually due to root stretching.

The femoral stretching test is not pathognomonic of an upper lumbar disc herniation, for it is likely to be positive with all forms of femoral neuropathy. Calvery and Mulder6 found that the commonest cause of femoral neuropathy was diabetes, although they excluded cases where there was any evidence to suggest a spinal origin. Ruptured aortic aneurysms burrowing into the iliopsoas muscle,10 retroperitoneal hemorrhages from hemophilia,11 or anticoagulation therapy14 may be a cause. Retroperitoneal tumors, particularly lymphomas, may be the offender.14

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References

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